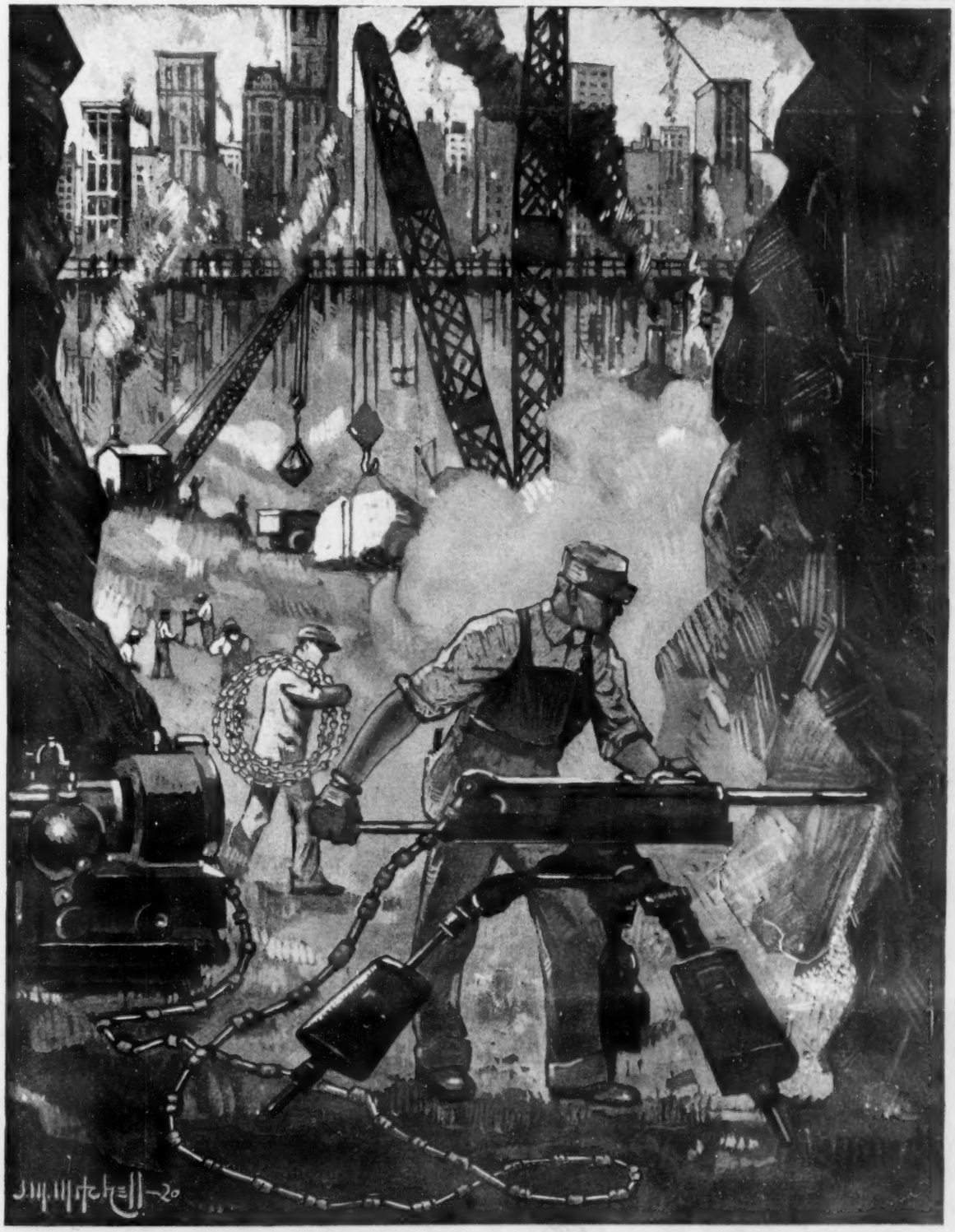
IN THIS ISSUE:

WINGED TRANSPORTATION
THAT MOON ROCKET PROPOSITION

SCIENTIFIC AMERICAN

A Weekly Review of Progress in

INDUSTRY · SCIENCE · INVENTION · MECHANICS



DRILLING ROCK BY MEANS OF ENERGY TRANSMITTED THROUGH A LIQUID COLUMN.—[See page 171]

Vol. CXXIV. No. 9
February 26, 1921

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New York Life Insurance Co.

(Incorporated under the laws of the State of New York)

346 and 348 Broadway, New York, N. Y.

DARWIN P. KINGSLEY, President

Balance Sheet, January 1, 1921

ASSETS		LIABILITIES	
Real Estate	$8,407,481.00	Policy Reserve	$759,017,764.00
Loans on Mortgages	164,796,225.60	Other Policy Liabilities	26,552,728.77
Loans on Policies	147,499,247.07	Premiums, Interest and Rentals prepaid	4,233,320.03
Loans on Collateral	6,565,500.00	Taxes, Salaries, Rentals, Accounts, etc.	7,270,905.89
Liberty Bonds and Victory Notes	109,722,115.37	Additional Reserves	6,733,983.67
Government, State, County and Municipal Bonds	141,539,552.50	Dividends payable in 1921	37,446,654.87
Railroad Bonds	343,293,117.30	Reserve for Deferred Dividends	76,176,646.00
Miscellaneous Bonds and Stock	8,416,460.10	Reserves, special or surplus funds not included above	49,232,393.96
Cash	10,574,203.04		
Uncollected and Deferred Premiums	13,711,710.24		
Interest and Rents due and accrued	12,087,598.25		
Other Assets	51,186.72		
Total	$966,664,397.19	Total	$966,664,397.19

During 1920 the Company Paid

To Beneficiaries	$35,453,758.67
To Living Policy-Holders	79,395,838.63
Total Policy Payments	$114,849,597.30

Dividends amounting to

$37,446,654.87

were authorized by the Directors and will be paid in 1921.

Over 200,000 new members (including former policy-holders who increased their membership) joined the Company in 1920 representing a total new business of

$693,979,400.00

The largest new membership in the history of the Company. The New York Life Insurance Company is what its name implies, A LIFE INSURANCE COMPANY. It transacts no other form of insurance. Its policies furnish the broadest coverage and provide

For payment of face amount upon due proof of death.

For payment of double the face amount in event of Accidental death.

For life income to the insured who becomes totally and permanently disabled.

There is a great opportunity in this Company for energetic, educated young men who desire to enter our business as a life work. For full particulars address either the Home Office of the Company or one of its Branch Offices.

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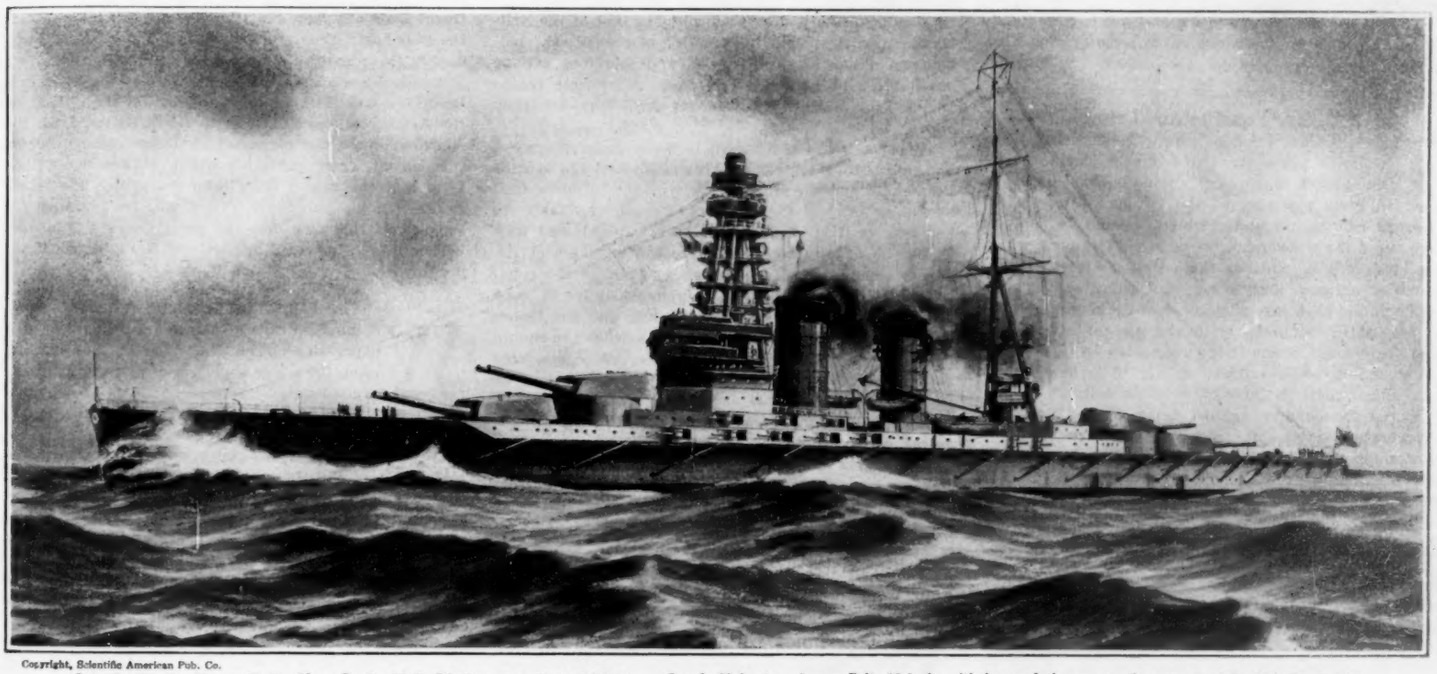
SEVENTY-SEVENTH YEAR

SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXXIV. NUMBER 9] NEW YORK, FEBRUARY 26, 1921 [15 CENTS A COPY 20 CENTS IN CANADA



Length: 660 ft. *Beam:* 95 ft. *Mean Draft:* 30 ft. *Displacement:* 32,000-34,000 tons. *Speed:* 23 knots. *Armor Belt:* 12-inch, with heavy deck armor. *Armament:* eight 16-inch, twenty 5.5 inch. Torpedo tubes, 8

The latest Japanese battleship "Nagato"

The Latest Japanese Battleship "Nagato"

The First Japanese Capital Ship to Include the Lessons of the Battle of Jutland

IN view of the great public interest just now in the navies of the world, particularly in regard to the proposed reduction of armaments, the accompanying wash drawing of the "Nagato," the latest Japanese battleship to be completed, possesses special interest. Although the modern battleships of all nations have reached a commonly accepted type, and are so generally similar in appearance that it takes a trained eye to recognize their individual silhouettes at a distance, the "Nagato" will be distinguishable at a glance by her remarkable five-legged foremast, with its many superposed platforms and fighting tops or, as they are now called, director stations.

The "Nagato," which was authorized in the 1916 program and laid down during the summer of 1917, was proceeded with slowly during the war and has only just been completed. She is one of a class of four ships, of which the "Mutsu" is practically completed and the "Kaga" and "Tosa" were begun in January, 1920. The four ships represent the work of Japanese designers and constructors, and the fabrication has been done in Japanese shops and yards. This class of ships invites comparison with the four United States battleships of the "Maryland" class, since they are of similar tonnage and were authorized in the same year. The main armament also is the same, though the speed is higher. Not much is known about the armor plan, and it is a pretty safe guess that because of the higher speed and heavier motive power of the Japanese ships, their defensive qualities are inferior to those of the "Maryland."

The "Nagato" is 660 feet long between perpendiculars, with a beam of 95 feet and a mean draft of 30 feet. It is probable that since she was built subsequently to the Battle of Jutland, the technical lessons learned in that engagement have been embodied in her construction, as they no doubt have been to a great extent in our own "Maryland" class. This means that particular attention has been paid in the submerged portion of the ship by the incorporation of anti-torpedo devices, though the beam would indicate that the bulge has not been adopted. The belt armor is believed to be not less than twelve inches, and the decks in the wake of the magazines have been strengthened as a protection against plunging fire.

The armament is very powerful, and this is the first battleship to mount the 16-inch gun, of which the ship carries eight mounted in pairs of turrets forward and aft. The gun is a powerful piece, firing a 2,460-pound-shell with a velocity of 2,500 feet per second and a muzzle energy of 106,000 foot-tons. The shell is considerably heavier than our naval shell, which weighs 2,100 pounds, but the high velocity of our naval gun of 2,800 feet per second gives it a greater muzzle energy of 112,000 foot-tons. The secondary battery is also very powerful, consisting of twenty 5.5-inch guns carried in broadside on the main and spar decks. The 5.5 gun is a new, long-caliber piece, coming midway in power between our own 5-inch and 6-inch guns. The "Nagato" carries also four 12-pounder anti-aircraft guns, and she is credited with the unusually heavy armament of eight 21-inch torpedo tubes; but we doubt that so many are carried.

Japan early adopted the tubular, tripod mast first used by the British; and she seems to like it so well that she has added three more legs until we have the imposing structure which towers above her fore bridge. It consists of a large central mast about which are built four inwardly inclined legs, the whole terminating in a large fighting platform above which are the separate, enclosed director-control stations, one for the main and the other for the secondary armament. A notable feature is the great number of searchlights, which are mounted upon successive platforms both on the fore and main masts and also on the after smoke-stack—evidence, this, of another lesson learned in the night-fighting at Jutland.

In their later ships, the Japanese have favored high speed, and the "Nagato" and "Mutsu" are reported to be 23-knot ships. The motor power consists of turbines of 46,000 horsepower and the propellers are driven through reduction gearing, a system which seems to be giving full satisfaction in the large powers with which it has been used in the later ships of the British navy, and notably in the battle cruiser "Hood," of 165,000 horsepower.

Development of Germany's Inland Waterways

GERMANY is manifesting activity in the development of its inland waterways and the traffic thereon. On November 2 there was organized a new transportation company under the name of the "Neptune Transport- und Schiffarts-Aktiengesellschaft," with offices in Basel. It is announced that this new concern was established through the collaboration of German, Dutch, and French shipping interests. This company plans to engage in the Rhine traffic between Basel and the North Sea ports.

Then, again, there is on foot a project for the canalization of the Main between Offenbach and Aschaffenburg for the use of heavy draft vessels. The Bavarian Government on November 3 voted its approval of this general plan. Furthermore, there was formed on November 3 in Bremen by firms, associations, and individuals in that city an organization having for its purpose the procuring of a canal connection between the Rhenish-Westphalian industrial region and the deep water harbors, located on the Weser and the Elbe.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

A Navy Equal to Any Other

THE report of the Senate Naval Committee contains not a word of sympathy with the request of a war-weary world to be relieved, at least in some measure, of the burden of naval and military armaments under which it labors. To have recognized the widespread prevalence of its plea, which has been fully as vocal in these United States as elsewhere, would have shown that the Committee was alive to the untold miseries and sorrows of the world and was in responsive sympathy with the present attitude of American people whom it represents.

The report confines itself strictly to technical matters, and it contains three outstanding features. First, it warns the country against being carried away by exaggerated statements as to the relative value of battleships as against airplanes and submarines. With this attitude of the General Board and the Senate Naval Committee we are in most thorough accord. For the present, and probably for many a year to come, the battleship will dominate the situation.

The second outstanding feature of the report is the statement that "this country should maintain a navy at least equal to that of any other power." At one time this statement would have been fraught with danger to the peace of the world; for during the years when the German navy was looming up as a threat to the insular security of Great Britain, it was the avowed policy of that country to maintain a navy superior to that of any other power. The removal of the German peril, coupled with the feeling of comradeship and understanding which was developed by our own and the British navy during the war, has so far changed the situation that Great Britain seems willing to make an exception in the case of the navy of the United States. Certain British statesmen and naval men have indeed asserted that they would view without any misgiving the creation of a United States navy that was equal in strength to her own. It is true that in its statement that we should possess a navy equal to any other, the General Board of the Navy is announcing an entirely new policy, so far as any public utterance emanating from that Board is concerned. Be that as it may, the acceptance by Great Britain of the new standard removes any danger of international complications; and a friendly coöperation of the two navies may well prove a powerful influence for the maintenance of peace and the general security of traffic on the high seas.

So far, so good. But when we consider the third recommendation of this report, to the effect that we should continue the construction of the whole of the 1916 program, we feel it our duty to utter a strong word of protest; first, because, as we showed last week, the completion of the full program would not only make our navy equal to that of any other but immeasurably stronger, and therefore we should be committed to a vast expenditure of moneys which would carry our navy far beyond the standard which is here definitely laid down by the General Board.

And this leads us to reiterate our demand on the part of the taxpayers of the United States that we complete only the four 16-inch gun battleships of the "Maryland" class and the six battle-cruisers of the "Constellation" class, and that we at once discontinue work on the six 43,000-ton battleships of the "Indiana" class and concentrate our new constructive efforts upon additional scouts, upon flotilla leaders, and upon airplane carriers, thereby rounding out our navy. This program will give us by 1924 a fleet that is not only somewhat larger in displacement and gun power than the British fleet, but one which, because of its very modern construction and its inclusion of all the lessons learned during the war, will possess a decided fighting superiority in capital ships over the British fleet, a fact which the General Board cannot deny. If we hold up the work on the six "Indianas" upon which only a mere commencement has been made, we shall still have 860,000 tons against Great Britain's 808,000 tons, and our gun energy will be 20,500,000 foot-tons against Great Britain's 19,000,000 foot-tons. Furthermore, the bulk of our fighting line will consist of thoroughly modern ships; whereas the best of the British ships, with the single exception of the "Hood," will be from eight to ten years old, and therefore will be obsolescent and outclassed. These significant truths should be embodied in this report. Why are they omitted?

These facts are not known to the average taxpayer, and unless they are clearly brought out on the floor of the Senate and the House, they will not be understood by the majority of the members of Congress. They are perfectly well known to the General Board, and they should be equally well known to the members of the Senate Committee. In all fairness, then, to the country whose interests have been committed in all good faith to the committees of the Senate and the House and to the members of Congress as a whole, it should be clearly stated that *the building of these six huge ships at a cost of nearly 250 million dollars will be superfluous, extravagant and a deliberate advance beyond the standard of strength definitely called for by the most experienced experts of our Navy as represented by the General Board.* The argument that to stop work on these six ships would be a wasteful extravagance is not borne out by the facts. Very little has been done, and what has been built in the way of castings for turbines and generators and motors and the laying of keel plates, will suffer no deterioration if it be allowed to rest for a while until the time is ripe for the completion of these ships.

Aqueducts Ancient and Modern

AMONG the outstanding landmarks of that dreary plain known as the Roman Compagna are the ruins, picturesque and dignified in their decay, of the masonry aqueducts through which the engineers of imperial Rome brought pure water from the distant hills to the city. To the casual visitor, such a monument of the past is but one among a multitude that tell of the glories of that city of a remote era. For how many of those who see and read about the aqueducts of Rome realize the positively stupendous scale upon which the hydraulic engineers of those days actually wrought? It is a fact, well attested, that Rome in the height of its magnificence received a daily supply through its fourteen aqueducts which reached a total of 400 million gallons of pure mountain water. If the mere figures fail to convey an adequate impression, let it be understood that before the opening of our Catskill aqueduct, when New York had five million inhabitants as against the maximum of one million credited to Rome, our total possible water supply, with all aqueducts going at full capacity, was less than that of imperial Rome, or, to be exact, 385 million gallons.

But why this huge expense and why this prodigality of use? Well, partly it is to be explained by the highly developed artistic taste of the Romans, who realized that a succession of fountain effects lent added grace to the architectural beauties of their public squares and their far flung colonnades. A fountain that plays throughout the day is an extravagant user of water, and Rome at its greatest and most beautiful period, when the public places of the city were graced, we are told, with some 4,000 bronzes and marbles of Grecian statuary, was enriched also with fountains in every square and well-nigh at every street crossing.

And then there were the public and private baths; for your well-found house in Rome was not complete without its bath, as the remains of wonderfully modern-looking plumbing abundantly testify. And water had to be found for the vast public baths such as those of Diocletian and Caracalla, after the main hall of which the fine waiting room of our 33rd Street station of the Pennsylvania Railroad was so faithfully modeled by the late Stanford White.

Today, thanks to our Ashokan Reservoir and the Catskill Viaduct, we have passed the standard set 2,000 years ago by Rome, and it would be possible, if we wished, to bring a daily supply of 500 million gallons through this conduit alone. Part of our present supply comes through the Croton Aqueduct, and through the Catskill Aqueduct the city is receiving 250 million gallons per day from Esopus Creek, whose waters are impounded in the Ashokan Reservoir.

Although it seems but yesterday that the new Catskill supply was opened for the use of the city, so rapid is our growth, reckoned indeed at 200,000 additional souls per year, that the city already has in hand the Schoharie Reservoir which, when completed, will double the present Catskill supply and afford another 250 million gallons daily. The waters of the Schoharie Reservoir will lie at a higher elevation than those of the Ashokan Reservoir, and they will be fed from the one to the other by means of an 18-mile tunnel driven through the intervening mountain. When the Gilboa Dam and the tunnel have been completed, the whole rainfall in the Schoharie Valley will be available for the use of this city and the great Catskill Aqueduct will be usable to its full capacity of 500 million gallons per day.

The Limits of Tidal Power

WE must be careful not to get an exaggerated impression of the available tidal power, even when the whole supply in any given district is rendered mechanically available. This is shown in a recent study by Norman Davey, published in *The Engineer*, in which the writer makes a comprehensive survey of the available tidal power as shown by the tide tables of the British Isles. We learn that at the extremity of Cornwall the mean range is about 12 feet and that as we go northward upon the west coast, it increases until a maximum mean range of 31 feet is reached at Portished, from which point the value decreases until it drops to 12 feet at the Mull of Galloway. Around the rest of the west coast of Scotland it rises to between 7 and 10 feet. On the east coast of Scotland the value is still low, the average being about 11 feet. It is 16 feet in the River Humber, and at the London docks the mean tidal range is 17¼ feet.

Considering the use of bays and estuaries for the development of tidal power, particular note must be taken of the difference in the area of the surface of the water at high and low tide. Thus, the estuary of the Salcombe River in Devonshire shows a high spring tide surface area of 2.4 square miles, and a low spring tide area of only .58 square miles, and this variation is found, to greater or less degree, at all the sites. In his study of the total tidal capacity of the United Kingdom, the choice was limited by the conditions of, first, a mean tidal range of not less than 15 feet; second, a total output reduced to continuous work of not less than 10,000 horsepower; third, the avoiding of building dams outside of large seaports; and, lastly, the necessity for keeping the length of the dam within reasonable limits. In all the stations thus selected, the half-tide system working at a constant head for three hours in every twelve was adopted, and the power factor is the value of the total power output reduced to a continuous average throughout both the monthly and daily cycles.

Within these limitations it was found that 21 bays and estuaries were available, ranging from a maximum at the mouth of the Severn, with a total average horsepower, reduced to a continuous basis, of 437,000, to a minimum at Fleetwood where it is estimated that the total average horsepower works out at 18,300. The grand total of horsepower thus available, in intermittent power, but expressed as an average continuous power factor, gives a grand total of 2,263,000 horsepower.

A survey of the tidal power possibilities of the world shows that there are not many localities in which the tidal range is sufficient for profitable power development.

Naval and Merchant Marine

The Submachine Gun.—During a recent test of the submachine gun (illustrated in the SCIENTIFIC AMERICAN of October 16, 1920), by a board of officers of the United States Army, using one of the .45 caliber guns with pistol ammunition, 1,000 rounds were fired before the gun was cleaned. The gun functioned reliably and the Board reported that despite the repeated firing it did not heat sufficiently to cause trouble.

An Adjustable Bow to Increase Speed.—Successful tests were recently made of a vertical hinged false bow for blunt-ended canal boats. The two leaves of the bow are attached at the corners of the square-ended bow and brought together forming a wedge-shaped entrance with a total angle of 110 degrees. In passing through locks, or at a dock, the two wings are folded back against the front end of the barge. The tests, which were carried out on the River Seine, showed that the resistance of the barges at a given speed was lowered 23.5 per cent.

Why Big Submarines Are Ineffective. — In a contribution to the submarine-versus-battleship controversy, Admiral Sir H. Bacon states that because of the constructional conditions attending submarine design, a craft which navigates below water loses a large per cent of her surface fighting efficiency. Ton for ton, the fighting and scouting efficiency of a submersible craft of whatever size is only about 15 per cent of that of the surface vessel. Sir George Owens Thurston, Naval Director of Vickers, Limited, gives figures to show that a submarine of 5,450 tons, having a surface speed of 30 knots, could mount an armament of only one 5.5-inch and one 3-inch gun.

Digesting the Lessons of the War. — Recently in Parliament the Chancellor of the Exchequer stated that before approving a program of new shipbuilding, the Cabinet were bound to satisfy themselves that the lessons of the war had been definitely ascertained. They had decided to charge the Committee on Imperial Defense with an exhaustive investigation into the whole question of naval power as affected by modern developments in naval warfare. This will consume, it is thought, some six months. It is believed that until results of this inquiry have been considered the British Government will present no program of capital ship construction to Parliament.

Shore Batteries Attack U. S. S. "Massachusetts." —Highly successful firing tests were made in January by our Coast Artillery against the old battleship "Massachusetts" off Pensacola Harbor, Florida. They proved that more destructive results can be obtained by firing projectiles from guns, mortars and howitzers at high angles than by horizontal attack against the belt armor. Twenty-five hits were obtained out of 85 rounds, the high angle firing being at distances of from 5,000 to 6,000 yards, carried out by 12-inch mortars. The results showed that railway artillery is as accurate as the fixed gun, and this in spite of the greater length of range. A number of hits were obtained by 12-inch railway guns at the great range of 20,000 yards.

Merchant Marine and the Navy. — The value of a strong merchant marine as an auxiliary to the navy is beyond question. No navy possesses a permanent fleet of transports and auxiliaries sufficient for its vastly extended needs in time of war. To supply the deficiency it must call upon the ships of its merchant marine for transports, colliers, supply and repair ships. Herein lies one powerful argument for the preservation of our new merchant fleet. Furthermore, the merchant marine is the nursery for the enlisted personnel of the navy. Aye, and for its commissioned officers as well; for many merchant officers performed faithful and very valuable service under temporary naval commissions during the late war.

The Fluctuating History of Our Merchant Marine. —In 1789, 23.8 per cent of our overseas commerce was carried in American vessels. By 1795, the proportion had risen to 90 per cent, and it stayed with remarkable evenness at that figure until 1830. Then came the era of iron and steel ships, when we had no steel works to take the place of our splendid forests in the provision of shipbuilding material. So there commenced a steady decline until by 1860 we carried only 66.2 per cent in our own ships. This was the time when we commenced to extend our great railway systems and turned our efforts to developing the interior of the country, and by 1870 the percentage had fallen to 35.6, a fall which continued until in 1910 when we carried only 8.8 per cent of our overseas commerce. Since that time there has been a very steady rise, helped, of course, by our war construction, until, in 1919, we carried 27.8 per cent of our overseas commerce in American bottoms.

Astronomy

The Infra-Red Solar Spectrum, rendered accessible by the use of plates sensitized with dicyanin, has been photographed at Mount Wilson Observatory as far as wave-length 9,900. Although the great majority of the 550 lines measured are of terrestrial origin, about 50 have been identified as solar lines through the detection of their displacements produced by the solar rotation.

Edgewise Phenomena of Saturn's Rings. — Several fellows of the Royal Astronomical Society gave an account, at the meeting of Dec. 10, of the phenomena attending the passage of the earth through the plane of Saturn's rings on Nov. 7, 1920, as observed at Greenwich Observatory with the 28-inch equatorial. On Nov. 6 the ring was easily visible, but no trace of it could be seen the following night. A few days later, although the dark side of the rings was then turned toward the earth, the brighter regions of the ring outside the ball were seen, indicating that an appreciable amount of sunlight is able to penetrate the ring, illuminating particles on the opposite side. The disappearance of the ring on Nov. 7 was also observed at the Yerkes Observatory by Professor Barnard, who estimated that the thickness of the rings could not exceed 40 miles.

Extraordinary Radial Velocity of Two Nebulæ.— A circular from the Lowell Observatory states that observations with the nebular spectograph indicate for the nebulæ N.G.C. 584 and N.G.C. 936, both evidently of the spiral family, much more rapid motion in the line of sight than has previously been observed for any celestial objects. A plate exposed to the former at various times between Dec. 31 and Jan. 14, the total exposure being about 28 hours, shows a spectrum approximately of the solar type, in which the lines are enormously displaced toward the red, indicating a motion of 1,800 kilometers (more than 1,100 miles) a second away from our system. In the case of the second nebula above mentioned the spectogram was obtained with a total exposure of 34 hours. The spectrum is likewise similar to that of the sun, and provisional measurements indicate a speed of fully 1,300 kilometers (more than 800 miles) a second away from us.

Sun and Moon Tables. — Beginning with the year 1917, the Naval Observatory in Washington published tables showing the time of sunrise and sunset and of moonrise and moonset for every day in the year, and for various specified latitudes. The data are for the meridian of Greenwich, but the corresponding values for any other longitude are very easily computed. The tables for 1917 and 1918 were published in a separate pamphlet; those for subsequent years have been incorporated in the American Ephemeris and Nautical Almanac and also in the abridged work known as the American Nautical Almanac. Apparently these tables are not yet well known to the public. It seems, therefore, desirable to call attention to the fact that the American Nautical Almanac, which contains a great deal of other astronomical information besides the tables mentioned, can be bought from the Superintendent of Documents in Washington for the modest sum of 15 cents.

New Light on Solar Variation.—The Director of the Astrophysical Observatory of the Smithsonian Institution, in his current annual report, announces that an almost exact correlation has been found between the fluctuations of solar radiation, as observed at the Smithsonian station at Calama, Chile, and variations of the brightness of Saturn, as observed by Dr. Guthnick from January to May, 1920, at the Berlin-Babelsberg Observatory, with the photo-electric photometer. One per cent increase in solar radiation was found to accompany 1 per cent increase of Saturn's brightness. The variations were not, however, synchronous but occurred in such a manner as to indicate that solar radiation is unequal in different directions, as might be supposed from the ragged ray-like structure of the solar corona. On this hypothesis, as the sun rotates on its axis the earth or any other planet receives radiation of different intensities as rays from different parts of the solar surface strike the planet in question. "This hypothesis," says Dr. Abbot, "relieves us of the great difficulty of understanding how so immense a body as the sun could vary in radiation so rapidly as our observations indicate. We have now only to suppose that there are inequalities of radiation in different directions, which may be due to the absorption of scattering of the rays in the coronal regions near the sun. These inequalities may persist with little alteration for weeks. We, however, note them as variations of solar radiation as they sweep by us in the course of the sun's rotation on its axis."

Automobile

Light Railways Not Popular.—The Transport Act of 1919 granted the Minister of Transport of England the power to advance money for the building of light railways. The plan, to the present time, has not met with much favor, since out of a total of $5,000,000 appropriated by the Government not more than $1,000,000 has been demanded. The commissioners in charge of the fund claim the conditions under which these governmental loans are allowed has much to do with their unpopularity, but it is the opinion of well-informed motor truck interests that the public refuses to place money in light railways for the simple reason that the motor truck has proved itself to be the logical vehicle for all short hauls in England just as they have in this country.

Soldering Auto Parts.—If it is desired to solder two pieces which have some thickness and bulk a good piece of work cannot be done with a soldering iron, because the parts will absorb heat faster than the iron can supply it. With such work a torch must be used for sweating, heating thoroughly the parts adjacent to the intended joint and as far back as may be necessary. If the surfaces are more than one-eighth to one-quarter inch wide it is better to tin them before uniting. This is done by spreading a smooth coat of solder over the entire surface while hot. It is only necessary to press two such prepared pieces together and heat them to the proper temperature to make a perfect union. This method is especially adapted to securing pipe fittings, such as nipples and unions to the copper or brass tubing serving to convey fuel and lubricating oil.

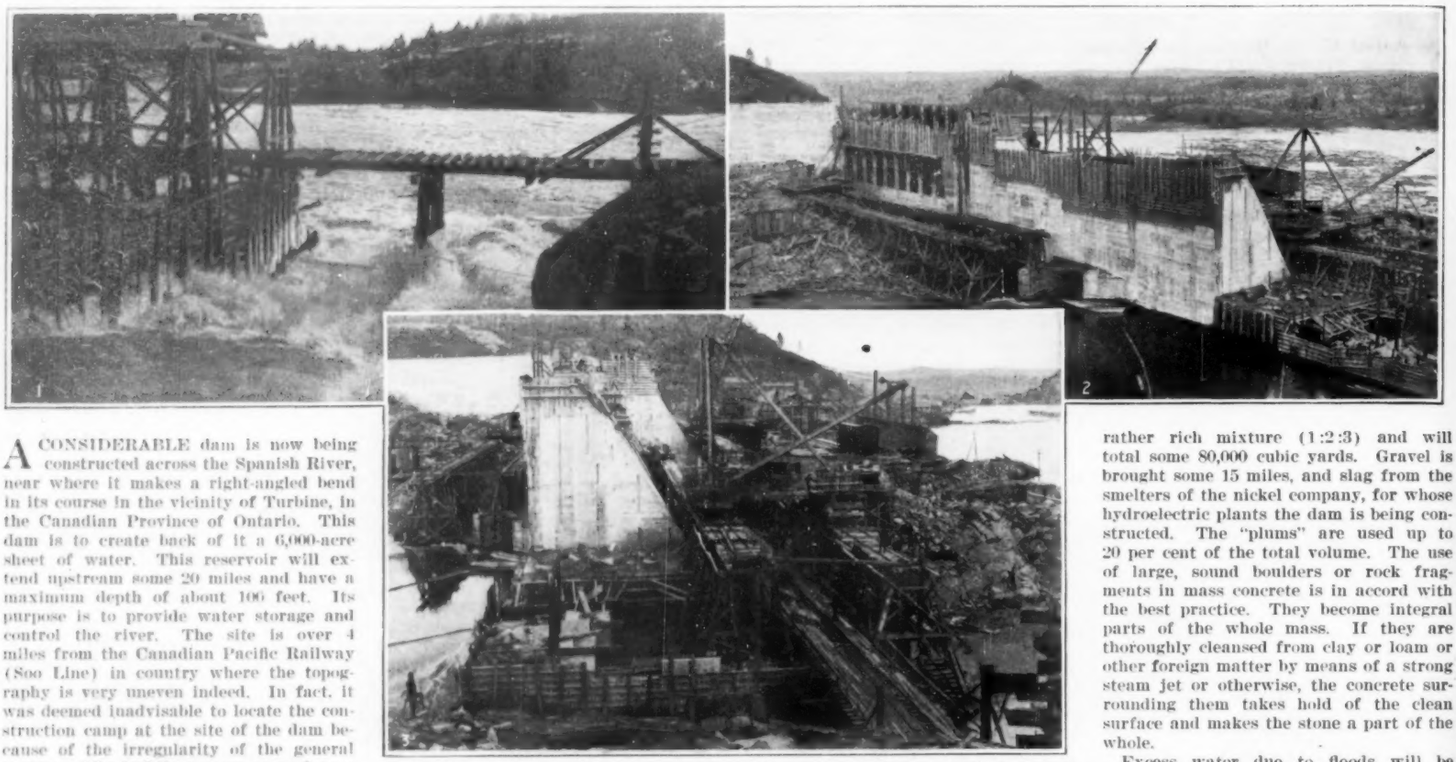
Repairing Scored Cylinders. — If the automobile engine has been run at any time without adequate lubrication, one or more of the cylinders may be found to have vertical scratches running up and down the cylinder walls. The depth of these will vary according to the amount of time the cylinder was without lubrication, and if the grooves are very deep the only remedy is to purchase a new member. Of course, if sufficient stock is available in the cylinder walls, the cylinders may be rebored and new pistons which are oversize, i.e., larger than standard, may be fitted. Where the scratches are not deep, they may be ground out with a high speed emery wheel or lapped out if that type machine is not available. Wrist pins have been known to come loose, especially when these are retained by set screws that are not properly locked, and as wrist pins are usually of hardened steel it will be evident that the sharp edge of that member can act as a cutting tool and make a pronounced groove in the cylinder. Cylinders that have been damaged in this manner have sometimes been repaired by the autogenous welding process, the oxy-acetylene flame being used to fuse new cast iron into the grooves, then grinding out the ridge of excess material in order to obtain a smooth bore. Another patented process is to deposit some hard metal, such as nickel in the grooves by the electroplating process or use iron deposited by the same means. Only the grooves are filled by this process as the remainder of the cylinder bore may be protected by some form of varnish or lacquer so the metal will not deposit except in the grooves prepared for its reception.

Truck Overloading Injures Highways.—Truck overloading is disastrous to both the vehicle and the highway. If its results were confined to the truck, it might be well to let each individual learn for himself that it does not pay. But, unfortunately, overloading is one of the principal causes of road wear. A motor truck designed to carry a certain tonnage is constructed throughout, including width of tires and safety factors, to handle just its rated load. Any considerable overload gives more than the standard 800 pounds per inch of tire width and concentrates the load on this small point of contact. Furthermore, the overload is not distributed on all four wheels, but rests entirely on the rear axle which further concentrates the load. Overloading does not materially cut down the speed and the result is that a higher rate of speed is maintained that should be given to the load, even though properly supported by adequate tire width. It has been extremely noticeable in sections where the use of large capacity trucks is discouraged that there is a strong tendency to overload small trucks. This is only natural, since the demand for motor hauling service remains the same and practically none can be diverted to other channels. When the smaller vehicle is overloaded, its effect on the road is tremendously magnified because its springs fail to function properly and the narrow bearing surfaces of its tires concentrate the impact forces so that they are greater than the road is capable of withstanding. There is economy both as to road wear and as to truck operating costs in big unit loads, but not when they are carried on vehicles too small to handle them.

The Big Eddy Dam

Some of the Difficulties of River Barrage in Rough Country

By J. F. Springer



1. The by-pass channel and the rail track that carried away the excavated material. 2. General view of the partly finished dam from the west bank. 3. Progress of construction after the site had been unwatered

Three stages in the building of the Big Eddy dam, Spanish River, Ontario

A CONSIDERABLE dam is now being constructed across the Spanish River, near where it makes a right-angled bend in its course in the vicinity of Turbine, in the Canadian Province of Ontario. This dam is to create back of it a 6,000-acre sheet of water. This reservoir will extend upstream some 20 miles and have a maximum depth of about 100 feet. Its purpose is to provide water storage and control the river. The site is over 4 miles from the Canadian Pacific Railway (Soo Line) in country where the topography is very uneven indeed. In fact, it was deemed inadvisable to locate the construction camp at the site of the dam because of the irregularity of the general surface. The buildings were erected on a side hill and the more considerable structures were made narrow and long in order that it might not be necessary to carry out expensive leveling operations. The irregularity of the external surface is, at the very site of the dam, well matched by the unevenness of the surface of the bed rock. An illustration of this latter unevenness occurs in the rock foundation in the mid-stream section of the river where the regulating sluices are located. The upstream face of the dam reaches very much farther down to secure its footing than does the downstream toe. But the irregularity is more complicated than this alone would indicate. The river bottom in the rock varies greatly in level as one follows the line of the dam across the stream.

The difficulties of carrying out the enterprise in the face of the foregoing character of the footing were only part of the total. The gorge through which the river here flows was by no means clear. Material from the adjacent banks and probably from points upstream covered it to a maximum depth of 30 feet. Big and little boulders and miscellaneous débris filled in the gorge and obstructed the way to the subaqueous foundation.

Under-water excavation had to be carried on. Drills were operated from floats and holes put down into the fixed and loose rock to depths of 10 to 15 feet. Casing pipe would then be inserted and a proper charge of 60 per cent dynamite placed. By such means, the great difficulties were reduced and the placing of cribs and caissons carried out successfully.

The dam is of the gravity type—that is, of the type that depends upon its weight to resist the pressure of the water. It is, altogether, 1,100 feet long. On one side of the stream is 400 feet of bulkhead, and on the other 114 feet. These are, for the most part, wings which extend from the end of the dam proper. The intervening section of dam—the dam proper—cuts across the stream in a straight line. It consists of various parts. There are spillway sections consisting of 19 openings of a standard width between partition piers of 17 feet each. In this way, 363 feet of dam is devoted to spillways. At one end of the dam proper, but separated from a spillway section by a 23½-foot trash run, is the head works. This structure is about 164 feet long and connects with a long bulkhead running off at an angle of about 45 degrees. Other features occupying length in the dam are the regulating sluices (60 feet) and a log slide.

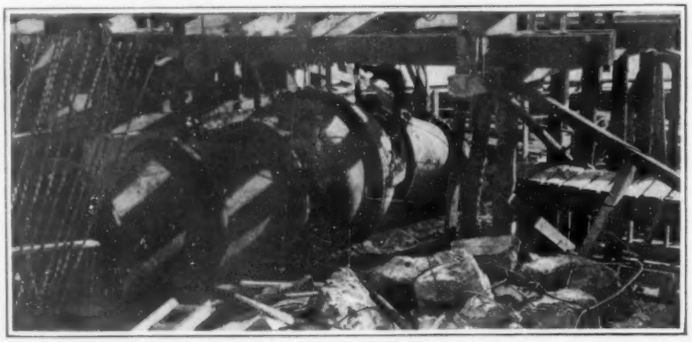
The Spanish River has at this point a summer flow of perhaps 800 second-feet. But in the time of flood, it may be ten times as great.

Cofferdams were constructed and caissons were let down. A space was left for the river. But, in order to unwater the site in this space, a kind of by-pass channel was constructed in the rock and earth at a point about 100 feet from the eastern side. This was a considerable trench, having been 500 feet long, 25 feet wide, and 28 feet deep. The rock requiring removal totaled some 14,000 cubic yards. This material, in blasted form, had to be got out and for this purpose stiff-leg derricks were employed. It was carried away on a short service railway and piled on the bank of the stream. Later on, much of this material was employed in the body of the dam as "plums" in the concrete. The concrete is a rather rich mixture (1:2:3) and will total some 80,000 cubic yards. Gravel is brought some 15 miles, and slag from the smelters of the nickel company, for whose hydroelectric plants the dam is being constructed. The "plums" are used up to 20 per cent of the total volume. The use of large, sound boulders or rock fragments in mass concrete is in accord with the best practice. They become integral parts of the whole mass. If they are thoroughly cleansed from clay or loam or other foreign matter by means of a strong steam jet or otherwise, the concrete surrounding them takes hold of the clean surface and makes the stone a part of the whole.

Excess water due to floods will be handled by the long spillway section while the water required to operate the present power house will be controlled by three large sluiceways built through the dam. These have three valves, each weighing about 25 tons. Then each sluiceway has its metal intake tube and metal discharge tube. These two parts add, for each sluiceway, 27 tons. Erection was carried out with the aid of vertical steel rods threaded at the upper end. These carried the weights. The threaded engagement at top enabled the heavy weight to be lowered and held at exact levels pending provision for permanent support. Horizontal adjustment was secured with the aid of jacks.

A good deal of compressed air was required for operating rock drills, hoisting engines and the like and for supplying the pneumatic caissons employed at an early stage of the work. Four air-compressors were put to service, all but one being of the high pressure type. The total capacity of the compressor plant amounted to 3,800 cubic feet of air per minute. At first, steam was used for operation; but later on electric current was substituted. The current came from the nickel company's power house at High Falls, 25 miles away. When the current arrived, it had a voltage of 35,000. A small transformer reduced this to 550 for motor use and 110 for lighting.

When one considers the big quantity of cement needed, the large valves and their connecting tubing, the steel penstock, the transformer equipment, and the various compressors, and other equipment, he is not especially surprised to learn that the contractor reconstructed 3½ miles of standard railway track connecting with the Canadian Pacific and extended it ¾ mile farther. It is, nowadays, considered quite the thing for those responsible for construction that is to be carried out in difficult country at points more or less distant from existing railways to put in their own track. The Hetch-Hetchy Railroad, built for use on the Frisco water supply project, illustrates what was done here at the Spanish River, only the California construction was on a much larger scale.



One of the 25-ton sluiceway valves

X-Ray Tests of Old Paintings

IN one of his note books Nathaniel Hawthorne relates the story of a man who, being in possession of a beautiful painting, perceived that it had been painted not upon a fresh surface but upon the top of an older painting. Inspired by curiosity and imagining, perhaps, that the older pictures might represent a greater value, he removed the upper layer of pigment to find, alas, that he had sacrificed a charming painting only to uncover a worthless daub. Had the unfortunate owner lived in this our 20th century, he need have taken no such risk, since researches recently made in several European countries show that the connoisseur now has an admirable implement in the shape of the X-ray with which to supplement his critical judgment concerning the antiquity of pictures and one revealing whether they were painted upon a virgin surface or upon one bearing a previous work of art. The latest works along this line have been done by a French scientist, Dr. Chéron.

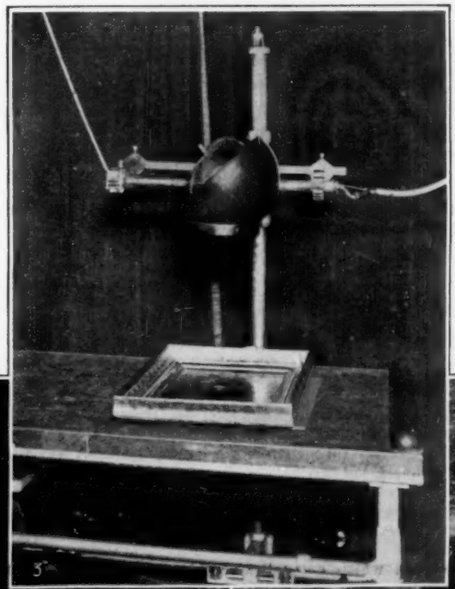
The degree of transparency to X-rays exhibited by any body depends upon the number and atomic weight of the atoms composing the said body. It is obvious that in every picture there are three substances to be considered from this point of view. In the first place there is the surface which is painted upon; this surface is usually either canvas or wood, especially in the case of earlier paintings; however, many other materials have been experimented with by different artists at various times, including plaster, ivory, paper, leather, silk, china and pottery and even cobwebs. Secondly, there is the priming or sizing which is applied to the surface to prepare it for receiving the colors. Third of course are the pigments themselves.

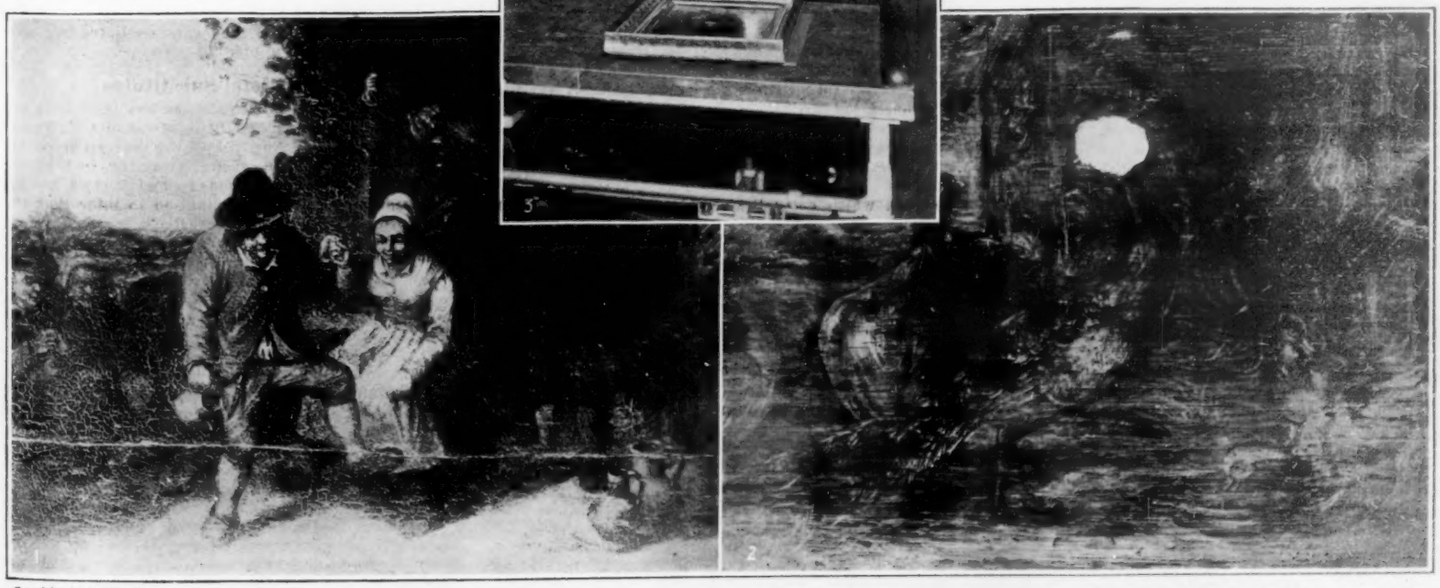
Both wood and canvas, the principal surfaces to which oil paints are applied, are highly transparent to X-rays, but the former is more so than the latter, as might be expected. The second element of the picture, the priming or sizing, is usually composed in the case of ancient pictures of carbonate of lime mixed with glue, and this composition has been found to be comparatively transparent to X-rays. Modern artists, however, depend almost entirely upon the material known as ceruse (white lead) which is much more opaque in character and which, moreover, penetrates the interstices of the canvas upon which it is spread.

An even greater difference exists in most cases between the pigments to be found in many of the works of the old masters and those of which modern painters make use. While the ancients employed mineral colors almost exclusively, those at the disposal of our modern artists include a number of colors derived from vegetable sources and others from the aniline group which, of course, were entirely unknown previous to the middle of the 19th century. The metallic paints used by the old masters are much more perceptible under the X-rays than modern paints made of vegetable and aniline dyes.

Space prevents us from going into the details of X-ray examination of paintings, which is covered at length in the February issue of the SCIENTIFIC AMERICAN MONTHLY. Suffice it to say here that radiographs throw a most valuable light upon the probable age of a picture, so that after devoting some study to their observation in the case of a given era, or by the hand of a known painter, the connoisseur can readily detect modern "fakes."

Disappearing type searchlight built in this country for use in Java





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Left: Photograph of a tableau attributed to the Dutch painter Van Ostade, made in the seventeenth century. *Right:* Radiograph of the same tableau, showing that it was painted in modern colors over an old painting of a barnyard scene. Note the two peacocks in the center foreground and the ducks at the right. The white spot is a lump of wax on the back of the picture.

Above: Dr. Chéron's apparatus for making X-ray pictures of paintings

How the X-ray may be used by the art connoisseur for checking up the authenticity of old masters

Java's Disappearing Searchlight

AMERICA'S mastery of coast defense problems is reflected in a certain shipment now going forward from a large American manufacturing plant to the island of Java, in the far-off Dutch East Indies. Four military searchlights, ranking well among the most powerful ever built and showing several interesting variations from type are to provide the far-seeing night eyes of an island seaport.

The four searchlights, each rated at 300,000,000 candlepower, were designed by Dutch and American engineers several years ago. In fact, preliminary plans were drawn up in 1914, but the war interfered temporarily with further progress.

Each searchlight carries a lens 36 inches in diameter. Inside the lens case, behind the carbons which produce the light, is placed a powerful parabolic mirror. The diameter of this mirror determines the size of the light. The mirror is of great importance. A superior quality of glass must be used, and the finest workmanship is necessary. It must be capable of standing an intense heat and of undergoing rapid cooling. It is manufactured with innumerable tiny facets, so that it will reflect the light rays straight out through the lens. Now the light rays that originate from the carbons are thrown upon the mirror, and reflected from there through the lens on a level line. The candlepower which is transmitted from the carbons to the mirror is multiplied many times when it passes out through the lens, because of the condensing effect of the optical system.

The Java searchlights are, following standard practice, provided with big iris shutters which screen or expose any desired proportion of the lens. This iris is made of brass scales that overlap in a rotating motion. In fact, these Java searchlights, like most searchlights of their style, can be controlled entirely from a distance. The observer who operates the light beam can be a considerable distance away yet can throw on or shut off the beam, swing it to any point around the sector, or raise or lower the searchlight by the mere pressing of buttons. The Java searchlights are to be located on four sides of a promontory. The light from each unit, traveling in a sector of 90 deg., will enable the whole battery of searchlights to survey the surroundings in every direction. An uninterrupted current supply will be ensured by four 25-kilowatt gasoline-electric generating sets located in a bomb-proof shelter at the base of the hill.

Searchlight engineers are reluctant to commit themselves, as a rule, regarding the distance that the largest searchlight will throw its beam. This is due to varying atmospheric conditions. When the weather is favorable, a surprising reach can be obtained. At other times, the light beam penetrates such a comparatively small distance that the discrepancy seems strange. It is pretty well admitted, however, that a searchlight of 500,000,000 candlepower will throw a beam that can be seen, when the night is fair, for at least 90 miles. Some extravagant claims of a longer lighting distance have been made, but not substantiated.

That Moon Rocket Proposition

Its Proponent Says a Few Words in Refutation of Some Popular Fallacies

By R. H. Goddard

EVER since, a year ago, announcement was made that a rocket was under development which should, in principle, be capable of reaching great altitudes, even as great as interplanetary distances, there have been numerous articles in magazines and papers of more or less authenticity.

To date, there has been little published criticism, except in an article in the November 20 *Graphic* (London). Chiefly in reply to the latter, it is believed worth while stating the purposes and possibilities of the investigation, although the writer prefers working quietly rather than issuing statements.

First, regarding the possible study of conditions at a great height in the atmosphere: Mr. Morrell, in the *Graphic* article, considers it unlikely that any instruments could survive a fall from so great a height. The important point is that the instruments and rocket *fall from rest*, and that under this condition even a small parachute must be sufficient to maintain the velocity at a safe value.

Thus, in the original Smithsonian publication, *Miscellaneous Collections*, Vol. 1, No. 2, p. 51, a calculation, based upon the air densities that very likely hold at high elevations, shows that if instruments supported by a small parachute fall from a height of 100 miles, the velocity would be reduced to, and maintained at, a safe value even before the 20 mile level had been reached. Attention is called to the first successful sounding-balloon ascension in America, at St. Louis, 1904, in which instruments fell 10.4 miles without damage, *even without a parachute*.

But even if this could not be done, the suggestion made in the original paper of leaving a few charges in the rocket to be used after a considerable drop had been made, in order to check the descent, would eliminate any question as to the possibility of checking the speed.

The value of the multiple charge rocket for high altitude research is obvious when it is realized that, save for a projectile fired from a gun, which would produce forces too great to be withstood by a delicate apparatus, this method is the only one that does not require the presence of air. Thus the record for airplanes is 6.8 miles, for sounding balloons 21.7 miles, and for pilot balloons (without instruments) 24.3 miles. As is well understood by the United States Weather Bureau, the balloon is limited to but a few miles farther, and if the region above this height is to be explored it must be by rockets of the type that has been described. Already the Bureau has suggested certain recording instruments for the purpose.

The writer has called attention to the value of simultaneous observations at the 7-mile level, from stations at considerable distances apart, as a means of obtaining a high altitude weather map for use in weather forecasting and in aviation.

Next, as to the question of propulsion beyond the predominating gravitational influence of the earth, the question that has given rise to most discussion is, perhaps, "What is the value of such performance, even granted that it is physically possible?" This question suggests others: "How are you ever going to recover anything that is sent off in this way?" "How can any 'volunteer' (of which there have been 18) return?"

In reply to all these questions, I wish to say first, that I have asked for no volunteers. My only previous signed statement, to the Associated Press, was to the effect that there were very interesting possibilities of the method, but that the work should be put upon a substantial basis before these were discussed. While I realize the absurdity of some of the suggestions *when they are viewed in the light of what has so far been published* regarding the realization of these suggestions, I wish to say that *there are other principles just as fundamental as the multiple charge rocket principle*, which I believe can be applied, concerning which experiments have already been performed in some cases, and which I further believe will lead to results of a nature sufficiently sensational to satisfy anyone.

If these matters were not to be kept confidential, at least until the work had been put upon a substantial basis, many who are either not familiar with physical principles, or who do not take the trouble to look into the matter sufficiently, would bring forward all sorts of criticisms, which would result in much talk and little actual accomplishment.

As an illustration of such criticism may be cited the comments made regarding the propulsion of a rocket in a vacuum. Experiments show conclusively that the reaction is even greater at a pressure of one fifteen hundredth normal than at the normal atmospheric pressure, yet when the first announcement of the work was made, surprise was expressed that the Smithsonian Institution could back such an absurd idea as that motion could be produced "by reaction against nothing."

In the *Graphic* article Mr. Morrell states that "bodies when they speed through the air are subject to friction against the air which is sufficient to generate tremendous heat" and that "the rocket will generate a red heat for most of the first hundred miles." This is what would happen if a high speed were maintained throughout this distance, and the air had the same density as at sea level.

As a matter of fact, in the Smithsonian publication in which the experiment is suggested, the velocity is chosen at each part of the path such as to make the mass of the rocket at the start a minimum, taking into account both air resistance and gravity. This velocity *must, of necessity, be small where the air is dense*, being under 2,000 ft./sec. for the first twenty miles, at which height the pressure becomes but one per cent that at sea level. Even at a 95 mile elevation, the velocity would be but slightly over 2 miles per second, where the air has an estimated density of but four one hundred millionths that at sea level. The speed of 6.4 miles per second, of which Mr. Morrell speaks as causing the rocket to "vanish in an incandescent wisp of flame and smoke" would not be supposed to be reached until an altitude of over 700 miles had been attained, at which height there must exist practically a complete vacuum. The case is entirely different from that of meteors, which enter the earth's atmosphere with an initial speed of over 8 miles per second.

Concerning next the possibility of striking the moon with a rocket, granting the possibility of attaining that distance, the further comment is made that the earth and moon are moving in different directions at high speeds, the gravitational pull of the earth is complex, and there are unknown air currents. In reply to these criticisms it may be said that although the speeds of the two bodies are high and different *they are known*, with great precision, at least sufficiently well to make possible the accurate prediction of eclipses, years in advance. Also any "incalculable vagaries of air currents," above 20 miles, occur in air of practically negligible density.

Further, as the writer has already suggested, there is the obvious possibility, in using the rocket method of propulsion, of correcting the flight by transverse impulses, if necessary, by the aid of photo-sensitive cells, such as the selenium or the thalofide cell, which latter increases greatly in sensitiveness at low temperatures.

In conclusion, not only does the writer believe that the multiple charge rocket principle is correct, as well as the further principles to which allusion has been made, but the experiments so far performed on the small model under test demonstrate clearly the practicability of the idea. This work is proceeding slowly because of the lack of really adequate support, although the Smithsonian Institution is doing as much as it can on a work of this kind. But although there exists the attitude that "everything is impossible until it is done," there is nevertheless widespread interest being taken in the work. To the writer's mind, the whole problem is one of the most fascinating in the field of applied physics that could be imagined.

BY WAY OF EXPLANATION

To the Editor of the SCIENTIFIC AMERICAN:

I am taking the liberty of enclosing a statement which you may care to use in the SCIENTIFIC AMERICAN or the MONTHLY, which is, to a large extent, a reply to recent criticisms of the rocket method upon which I am working.

I have received a number of requests from papers for a statement of this sort, but prefer to have it appear in a publication of recognized standing.

[*Signed*] *R. H. GODDARD.*

Clark College, Worcester, Mass.
January 12, 1921.

When Body Heat Affects Weighing Operations

THERE is maintained at St. Cloud, France, the International Bureau of Weights and Measures. And as is quite befitting such a bureau, the methods employed and the apparatus available for the comparison of weights and measures are accurate to a heretofore undreamt of degree. Indeed, in recognition of the work of this institution and particularly of its director, the Nobel Prize for Physics for 1920 has been awarded to M. Charles Edouard Guillaume.

Perhaps none of the features of this remarkable institution is more noteworthy than the precision balances, a description of which is included in the detailed interview with M. Guillaume, which appears in the February issue of the SCIENTIFIC AMERICAN MONTHLY. These precision balances are of great delicacy, nearly all of them being so constructed that they may be read at a distance. Insulated in glass cages supported in piers of masonry which do not touch the floor, they are employed to make comparisons of mass, especially of standard kilogram. One of them, made by Dr. Bunge, is even capable of determining weights in a vacuum.

The day before that fixed on for the experiment the observer places in the cage of the apparatus the weights needed for the next day's work. He then avoids approaching the balance lest thermic disturbances be produced by the heat of his body. Twenty-four hours later, by means of one of the long metal rods which extend from the balance to the observation post, so to speak, he performs the desired weighing operation at a distance of four meters. In other words, the ingenious mechanism at his disposal enables him to place the weights upon the pans, to release the latter, etc., without coming near the scales. He watches the oscillations of the beam of the balance by means of a small telescope. A mirror firmly attached to the balance beam reflects a graduated scale whose movements made when the beam oscillates are seen by the experimenter through the telescope.

German Metal Substitutes

A GREAT deal of generalization has been indulged in on this subject, but little of definite statement or concrete detail. Any person in possession of his normal senses must know that Germany had to use other metals in place of copper; and it does not require a great deal of discrimination to infer that the metals which she would use are those which she had. But this is far from telling us just what she did and how she did it, or how her substitutes were made up, or how they stood the test of service. For this purpose the narrative of General Director Albert Wuerth, concluded in the SCIENTIFIC AMERICAN MONTHLY for February, from the January issue, is admirably suited.

Chemistry in Camouflage

WHEN it became necessary to distinguish between different types of green in order that various types of camouflage might be detected in photographs, the solution of the problem ultimately rested with the chemist and the physicist. It was found that so-called uviol and uranium yellow glass, such as had been made by Schott & Company in Jena, would pass a band in the red beyond the visible red and that the green in chlorophyl appeared as red through such a filter. Grass and trees when viewed through such a filter appear red, but green paint continues to appear green. With this as a starting point filters were made finally of sheets of gelatine so stained with a chemical compound as to give the same effect as had been first observed in glass with known chemical compounds.

Shall We Have a National Trade-Mark?

The Advisability of Identifying American Goods in the Markets of the World

By Ernest Townsend Williamson

THE agitation in favor of the adoption of a national trade-mark which has been carried on with varying degrees of energy for several years seems likely to gather fresh strength in the near future. It is expected that another bill providing for such a mark will soon be introduced into Congress and that business men will once more be called upon to express an opinion as to the advisability of employing some distinctive symbol or form of words to identify American goods in the markets of the world.

The growth of the idea of a national trade-mark furnishes an interesting bit of history. The notion may be said to have been "made in Germany." In 1887, it will be remembered, Great Britain passed the Merchandise Marks Act, which required, among other things, that imported goods which as ordinarily marked might be mistaken for British should be further identified so as to indicate the true country of origin. The Act was, by its terms at least, merely defensive, making the mark of nationality necessary only in cases where the private trade insignia tended to mislead. But Germany, compelled to stamp "Made in Germany" upon her exports to Great Britain, quickly forged the phrase into a deadly weapon of offense—with results known to all.

The startling success of the German designation, combined with the practices of the Kaiser's subjects, soon produced its natural reaction in other countries. Belief in the advantages of marking goods with some sign of their national origin developed rapidly in Europe and later took root in America. There are now in use several marks that may be described as national trade-marks, although none of them is such in the fullest sense of the term.

In France one of the first steps toward combatting the unfair use of the German designation was taken by the associations of manufacturers and merchants, such as those representing the hardware trade and the toy business, which sought to protect the products in which they were interested by means of collective marks, to be used only by their members who were French and who actually manufactured in France. From these came the idea of one grand collective mark which should be owned by a union of the principal associations and serve to guarantee the French origin of the goods to which it should be applied. Accordingly, in 1915, such an organization, called *Union Nationale Inter-Syndicale*, was formed and made the custodian of a mark which should answer the purpose of a national trade-mark. This symbol consists of the word "*Unis*," made up from the initials of the corporate name, and "France," enclosed together in an ellipse. It is designed in several forms, large and small, so that a manufacturer can choose the one best adapted to his product. The right to use it is granted only to persons who are manufacturers on their own responsibility and who are of French birth or have been naturalized citizens of France for at least fifteen years. Companies can use it only if they are actually French, their nationality being determined by the facts of each case. The mark can be affixed only to French products, and the general rule is that an article shall be considered French if made of raw materials from France or her colonies; the fact that the finished product contains pieces or parts that cannot be obtained within the prescribed territory does not, however, disqualify it absolutely, but in each case the individual association to which the manufacturer belongs must decide whether, considering the resources of the French market, the incorporation of the foreign materials was necessary.

In Switzerland also the fear of Germany led to the adoption of a national mark. Before the close of the war it was freely predicted in Europe that Germany would use Switzerland as a "jumping-off place" for dumping her goods into the countries of her former enemies, and the Swiss looked to such a mark as one means of self-protection. This, like the French symbol, belongs to a voluntary coöperative association called "*Syndicat pour l'Exportation Suisse*," and consists of the word "*Spes*," formed from the initials of that name. The right to use it is granted upon practically the same conditions as those enforced in France.

Several other countries employ marks which may be described as national trade-marks in a more limited sense. Denmark has the so-called "Lur Mark" (the "lur" being an ancient form of wooden trumpet, four representations of which constitute the distinctive feature of the symbol), which the law requires to be used upon all Danish dairy products. Cuba obliges manufacturers to place certain official seals upon boxes and other receptacles containing cigars and cigarettes made in Cuba and intended for export. In Ireland the Irish Industrial Development Association controls the use of a mark—consisting of a circular device enclosing the words "Made in Ireland" in Gaelic—permitted only upon goods manufactured in Ireland and made, in general, of Irish raw materials.

The two leading commercial countries, Great Britain and the United States, have not yet been able to make up their minds as to the value of a national trade-mark. Discussion in both countries has occasionally waxed warm. Thus far both the British and American advocates of the adoption of such a mark have failed to carry their point. But they refuse to be silenced.

In Great Britain the agitation in favor of a British trade-mark to be applied to goods of British origin arose as far back as 1894. Later the British Empire Trade-Marks Association was formed, and in 1914 this organization sought to register the British Empire Trade-Mark. The project met with strong opposition on the part of powerful commercial interests. The principal argument advanced against it being that a national mark would endanger the value of private trade-marks, and the Board of Trade refused the application on the ground that the registration would not be for the public interest.

(*Continued on page 175*)

Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

Incursive Somnipathy

To the Editor of the SCIENTIFIC AMERICAN:

Recently I witnessed a strange occurrence at Riverside Drive and 120th Street. It was mid-day and bright sunlight flooded the broad, dry expanse of asphalt. A large limousine was rolling north at fifteen miles per hour. At the rear a similar vehicle approached, moving faster.

Both cars were driven by chauffeurs, and the passengers were women. There was ample space for the second car to pass, but to my astonishment it came up behind and crashed squarely into the first machine.

It was absurd.

The second driver had sat at ease, his hands on the wheel, his gaze straight ahead. There did not seem to be anything to divert his attention.

I stepped over to where the two cars now stood. No one was hurt, simply jarred. The passengers' sensibilities were rudely irritated, one party resentful, the other nonplussed.

The second chauffeur was apologetic, admitting to the women his fault, although insisting that he could not account for his carelessness. But the first driver understood. They both understood. Superficial explanations were not for their belief.

Asleep at his wheel—sound asleep. The faulty driver was evidently a victim of incursive somnipathy. Psychology or physiology doubtless has a better term, but I do not recall it. A self-induced, yet uninvited malady, with the symptoms of which many auto drivers and engineers are more or less familiar.

The colliding chauffeur had been gazing steadily at the bright, streaming roadway flowing smoothly beneath him. Its monotonous sameness concentrated his mental faculties to the point of inducing momentary self-hypnotism.

In the field of railroading, when experienced engineers run by opposing signals, I wonder if the cause might not often be attributed to this insidious malady?

Often the charitable explanation in cases fatal to the engineer has been the possibility of heart failure or a sudden stroke causing a dead hand to hold the throttle prior to the accident. But it is possible that the effect of the unwavering stretch of twin rails blending with the even, gray right-of-way, and dissolving under the engineer's searching gaze, burnt into his brain a converging, soothing, hypnotizing desire for sleep, peaceful and potent beyond the exercise of his inhibitory will.

What might be the explanation of the series of seemingly inexplicable and appalling accidents which occurred on one of our great eastern railroads a few years ago? Or of the motorman on the New York Elevated Railway, who ran by definite daylight signals, with resultant fatalities? Or the taxicab driven down Broadway which suddenly left the street, crashing through a plate glass window and without warning pushing two passing men before it, injuring them seriously, while jagged daggers of broken glass pierced the driver's brain beyond the power of conscious explanation?

An acquaintance of mine who drives his own car about the city, said that he had sometimes been aroused from a sound sleep by the wheels of his car rubbing against the curb. A chauffeur told me that he saw a car waver from its course, swerve across the Drive at 78th Street, crash through the protecting chains at the edge of the walk, and finally stop down among the trees in Riverside Park. It was one of those freak happenings in which the car was not badly damaged, and the chauffeur was merely awakened from his lethargic sleep. The steering arrangement of his car was found to be all right, eliminating this mechanical feature as a possible cause of the mishap.

In many cases coming under this category, the period of mesmeric sleep may be brief, but an instant after consciousness flees, the chauffeur or engineer becomes a sinister weapon of fate. In that instant he faces oblivion and draws down the shadow of eternity upon his unsuspecting charges.

Our wonderful human personality seems to snap so easily. It goes right on trying to destroy itself through the agency of the very creations of its highly developed objective mentality. A routine gear cutter stops as the last thousandth of an inch is microscopically removed. Even an automatic feed printing press prevents damage to itself when more than one sheet of paper tries to pass at the same time.

An automobile is said to be practically fool-proof. It almost runs itself if you can afford to buy the gasoline. Its mechanical perfection is close to realization. The most alert and constructive brains of mankind have been directed toward making it a thing of beauty, efficiency and comfort.

But the being that tries to control this modern Frankenstein is not machine made. It is not automatic. It cannot prevent its own destruction. It is human!

So far it has not been possible to synchronize the human soul with steel and iron and rubber so that our subconscious senses will operate to stop the flight of a sleep controlled car or the sweep of an unrestrained locomotive. Yet, fanciful as it may sound, I believe it is within the scope of an Edison to harness the pulse, or register the variant blood pressure, or measure the muscular reflex, as soon as sleep takes possession of the body, and by utilizing a most marvelous and delicately attuned apparatus, to cause these involuntary bodily reactions to sound a waking alarm to the driver, or actually to work in some way to automatically stop the rush of an automobile or locomotive.

Doubtless there are times when the automobile driver or engineer takes control when physically tired or under some emotional stress. Dissipation, worry and preoccupation also contribute to occasions of misjudgment and rash action. But if we can make the distinction clear enough, there is food for thought in the idea of Incursive Somnipathy existing at other times under certain conditions, whether the victim is of normal health and habits, or due to a deflection in his coördinating powers is rendered susceptible to a favorable degree.

The idea expounded is not new to science, as early authorities have taught that by steadily gazing at any object a man can hypnotize himself without knowing it. And to make it more of a paradox, the passive symptoms would seem to manifest themselves in the case of drivers of long experience for the reason that they are no longer prone to excitement. Familiarity with a long stretch of road, or right-of-way, and the novelty of their work having passed, it becomes a matter of routine, or second nature, disarming the precautionary senses and favoring a passive condition.

New York. DANIEL O. SKINNER.

Winged Transportation

A Survey of Commercial Air Services Both Here and Abroad

By Ladislas d'Orcy

THE saying, "Distance lends enchantment," is particularly true in respect to commercial aviation. Anyone reading foreign aeronautical magazines can easily gather the impression that Europe is simply seething with air transport activities; that any reputable firm desirous of establishing an airway is promptly subsidized by its government; that Europe is covered with commercial air lines, and so forth.

As a consequence few people realize how far American achievements have outstripped foreign accomplishments in the matter of air transport. With a view to correcting many fanciful views on this subject, an attempt is made here to present in a readable form all the essential information regarding air transport activities in the United States and abroad. This includes the air routes in operation and projected, the names of the companies operating them, the type of aircraft used and the length of every route.

A cursory examination of this information will reveal to the reader that the longest regularly operated airway in the world is the United States air mail route from Washington to San Francisco (2,484 miles), while abroad there are but two airways of over 1,000 miles' length, neither of which exceeds 1,200 miles.

One of these connects Toulouse, France, with Casablanca, Morocco, and has tri-weekly service, while the other operates in the Belgian Congo on the schedule of three trips per month. Both lines traverse territory which is ideal for flying: fogs are practically unknown in those regions, elevations are moderate, if any, atmospheric conditions are, except for certain well defined seasons, remarkably even, and landing places are frequent.

On the American transcontinental air route flying conditions are far from being so favorable. Fogs are very frequent on certain sections, violent winds prevail over the Rocky Mountains and over the Alleghenies, extreme colds are encountered in the winter, and natural landing places are often few and far between. It follows that the ground organization required for making of our transcontinental air line a success involved problems far more difficult to solve than could be met on the two African routes. Furthermore, while the United States air mail operates daily, except on Sundays, the two foreign lines are under contract to run only tri-weekly and five monthly services, respectively. Taking into consideration all of these factors, it can be said without overstating the case that the United States is by far in the lead in air transport activities.

It may be objected that our transcontinental airway does not transport passengers and goods, while practically all the foreign air transport services do so. But this argument has little weight against the fundamental fact that there exists between the Atlantic and the Pacific an air route equipped with air ports, supply depots and emergency landing fields which is readily available for public air transport. That its use has so far been confined to the carriage of mails does not invalidate the fact: it merely illustrates certain local conditions.

This naturally brings up the question of the air transport subsidies. So far only France has adopted this policy, although it appears to be the consensus of opinion abroad that public air transport services will not be able to make profit or even cover expenses *for the next few years* without some sort of government assistance. It may be asked why the government should be expected to step in here and act as a godfather to the air lines instead of letting the latter flourish or perish on their own merit.

The answer to this query is that, as the next war will undoubtedly be a real first class air war, starting with bombing raids on barracks, dock yards, concentration points, railroad junctions, etc., reasons of national defense make it imperative for the United States to have a powerful air force. But as financial considerations make it impossible to maintain in times of peace the air force we will need in a war of any importance, the existing air force is intended to be merely a nucleus which expands to its full force only in time of war. For this war-time expansion the air force requires two things in times of peace: manufacturing facilities and a reservoir of men versed in air navigation. But this industrial and personnel reserve can no more exist without a flourishing air transport industry than the Navy could fill its ranks without a merchant fleet. Hence it is most important that the government intervene in some manner to help in building up a merchant air fleet and in keeping it going until it can carry on without outside assistance.

One of the French cabin airplanes used on the Paris-Warsaw route

That this assistance should take the form of an outright subsidy, such as the French system, is disputed by many keen observers. The French government grants a subsidy to "legally constituted air transport companies operating regular services of public utility," said subsidy being divided into four parts: (1) for maintenance and deterioration of the aircraft; (2) for non-stop distance traveled; (3) for speed maintained and useful tonnage; and (4) for military adaptability of the aircraft. The weak point of this system is that in practice it gives financial assistance to any company which keeps machines flying, while it does not pay sufficient regard to the value of the work done or the commercial utility of the aircraft employed. Furthermore the subsidizing of military adaptability openly puts a premium on military features and so tends to counteract the development of purely commercial—and therefore profitable—machines.

WE have got into the habit of believing that Europe is far ahead of us in the matter of aviation. Faster machines, better climbers, more reliable engines, more unique designs, better construction, more commercial applications—all these things we credit to our friends abroad and without ever bothering to look into the status of our own aeronautical industry. It was with the idea in mind of learning just what progress has been made in commercial aviation the world over, and just where America stands in this matter, that we asked Mr. d'Orcy to study the situation and prepare an article. This he has done—and done admirably, quite living up to his reputation as an authority on international aviation. Among other things, Mr. d'Orcy brings out the surprising fact that the United States is by no means lagging behind in commercial aviation, and, if anything, is setting the pace as far as long-distance and difficult service is concerned.—THE EDITOR.

The British government, on the other hand, provides only indirect assistance to air transport firms in that it assumes responsibility for the organization of air ports, the wireless and weather services, and research and experimental work. Clear thinking Englishmen begin to realize, however, that this assistance is not sufficient to enable their air transport enterprises to "carry on" during the period in which converted war material is being used up. In this respect it is significant that the British Advisory Committee for Civil Aviation in its recently issued report went on record as favoring a scheme of air transport subsidy that would grant financial assistance in proportion to service rendered.

Other countries, like Poland and Czecho-Slovakia, grant subsidies in the form of a lump sum per mail flight on approved routes.

In this country Government assistance entered the field last fall, when the Post Office Department contracted with several air transport companies for the carrying of mails on approved routes and schedules. This system, which essentially consists in paying a given sum for a given service, is undoubtedly sound in principle. Still, it is open to criticism insofar as it excludes competition and so does not encourage performance beyond that strictly necessary to fulfil the terms of the contract. Nevertheless, such as it is, our mail contract system is at least as good as, if not better than, the foreign system of subsidy already mentioned.

Below there is given a tabulation of the world's air transport services as far as information is available. The services listed include those actually in operation as well as those for which contracts have been awarded by the respective governments. It should be noted that all foreign air transport services are privately owned and operated and that almost all carry passengers, although some do not carry mails. All the French air lines listed are subsidized, the services to Prague and Warsaw being also subsidized by the Czecho-Slovak and Polish governments, while the Malaga to Casablanca line also draws a subsidy from the Spanish government.

The German air transport services, which are subsidized in some form by the German government, operate on more or less irregular schedules, owing chiefly to the scarcity of gasoline. It is possible that service on some of the routes listed has been suspended until next spring.

No recent information is at hand regarding the Colombian and Far Eastern air transport companies and the information is merely given for the sake of completeness.

THE WORLD'S AIR TRANSPORT SERVICES

United States

(A) GOVERNMENT OWNED AND OPERATED SERVICES

(The United States is the only country in the world to have a government-owned and operated air transport service.)

U. S. Air Mail Service, Post Office Department, Washington, D. C.

Routes: (1) Washington-New York (218 miles). Daily, except Sundays.

(2) New York-Cleveland-Chicago-Omaha-Cheyenne-Salt Lake-Reno-San Francisco (2,266 miles). Daily, except Sundays.

(3) St. Paul-Chicago-St. Louis (610 miles). Daily, except Sundays.

Fleet: Forty DH-4M (400 hp. Liberty). Mail load, 400 lb.

Twenty Twin DH (two 200 hp. Liberty). Mail load, 600 lb.

Seventeen Curtiss R-4-LM (400 hp. Liberty). Mail load, 400 lb.

Seven Curtiss JN-4H (150 hp. Wright). Mail load, 200 lb.

Seven Curtiss-Standard J-1 (150 hp. Wright). Mail load, 200 lb.

Five Junkers, JL.6 (240 hp. B.M.W.). Mail load, 1,000 lb.

Three G. L. Martin (two 400 hp. Liberty). Mail load, 1,500 lb.

Two Curtiss HA. (400 hp. Liberty). Mail load, 800 lb.

One L.W.F. (240 hp. Isotta-Fraschini). Mail load, 600 lb.

Delivery of twelve DH-4M and forty-nine L.W.F. mail airplanes is pending.

(B) PRIVATELY OWNED AND OPERATED SERVICES

Aeromarine West Indies Airways, Inc., New York.

Route: Key West-Havana (106 miles). Daily, except Sundays.

Fleet: Six F-5-L (two 350 hp. Liberty) cabin flying boats. Mail load, 500 lb. Passenger capacity, 11. Carry U. S. mails.

Hubbard Air Transport Company, Seattle, Wash.

Route: Seattle-Victoria, B. C. (84 miles). Ten trips per month.

Fleet: Boeing seaplanes and flying boats. Carry U. S. mails.

Aero Limited. New York.

Route: Miami-Bimini-Nassau, B.W.I. (200 miles). Irregular.

Fleet: F-5-L (two 350 hp. Liberty) and HS-2L (350 hp. Liberty) flying boats. Passenger capacity, twelve and six, respectively.

America Trans-Oceanic Company. New York.

Route: Miami-Bimini-Nassau, B.W.I. (200 miles). Irregular.

Fleet: Curtiss H-16 (two 350 hp. Liberty), HS-2L (350 hp. Liberty), Curtiss Seagull (150 hp. Curtiss), and Curtiss MF (90 hp. Curtiss) flying boats.

Lawson Airline Company. Chicago.

This company is under contract with the U. S. Post Office Department to carry mails on a daily schedule on the following routes:

(1) New York-Harrisburg-Pittsburgh-Fort Wayne-Chicago (735 miles).

(2) Pittsburgh-Columbus-Cincinnati-Indianapolis-St. Louis (600 miles).

(3) New York-Washington-Raleigh-Columbia-Atlanta (815 miles).

A fleet of three-engined cabin airplanes having a mail capacity of 1,500 lb. and accommodations for sixteen passengers is under construction. Service on route 1 is to start next spring.

Mercury Aviation Company. Hollywood, Cal.

This company, which for the last year has been operating irregular air transport services in southern California, proposes to establish next spring a regular passenger air line between Los Angeles and San Francisco (340 miles).

Handley-Page cabin airplane at a London airport, about to start for Paris

France

Compagnie Générale Transaérienne. Paris.

Route: Paris-London (223 miles). Tri-weekly.

Fleet: Nieuport cabin airplanes.

Compagnie des Messageries Aériennes. Paris.

Routes: (1) Paris-London (223 miles). Tri-weekly.

(2) Paris-Brussels (155 miles). Tri-weekly.

(3) Oran-Casablanca (450 miles). To open next spring.

Fleet: Bréguet 320 hp. and 450 hp., cabin airplanes.

Compagnie des Grands Express Aériens. Paris.

Routes: (1) Paris-London (223 miles). Bi-weekly.

(2) Paris-Brussels (155 miles). Trips to be made tri-weekly.

Fleet: Farman Goliath (two 260 hp. Salmson) airplanes.

Compagnie Franco-Roumaine de Navigation Aérienne, Paris.

Routes: (1) Paris-Strasbourg-Prague-Warsaw (875 miles). Tri-weekly.

(2) Paris-Strasbourg-Vienna-Belgrade-Bucharest - Constantinople (1,600 miles). To open next spring.

Fleet: Potez S.E.A. (320 hp. Lorraine).

Société "Aéro-Transport." Paris.

Route: Paris-Geneva (280 miles). Five trips per month.

Fleet: Salmson (260 hp.) airplanes.

Compagnie Française des Courriers Aériens Atlantique-Méditerranée. Toulouse.

Routes: (1) Toulouse-Bordeaux (130 miles). Four weekly.

(2) Toulouse-Montpelier-Marseille-Nice (330 miles). Four-weekly.

Fleet: Salmson (260 hp.) airplanes.

Lignes Aériennes Latécoère. Toulouse.

Routes: (1) Toulouse-Barcelona-Alicante-Malaga-Tangier-Casablanca (1,170 miles). Tri-weekly.

(2) Malaga-Tangier-Rabat-Casablanca (250 miles). Five-weekly.

(3) Paris-Bordeaux-Madrid-Lisbon (1,000 miles). To open next spring.

Fleet: Salmson (260 hp.) airplanes are used on routes 1 and 2; Farman Goliath (two 260 hp. Salmson) airplanes are to be used on route 3.

Compagnie Franco-Bilbaine de Transports Aéronautiques. Bordeaux.

Route: Bordeaux-Bayonne-Bilbao-Santander-Gijon (330 miles). Tri-weekly. Only the section Bayonne-Bilbao is in operation.

Fleet: Lévy (300 hp. Renault) and Tellier (200 hp. Hispano) flying boats.

Compagnie Aérienne Française. Paris.

Route: Nimes-Nice (130 miles). Bi-weekly.

Fleet: A.R. (190 hp. Renault) airplanes.

"L'Aéronavale," Société Maritime de Transports Aériens. Marseille.

Route: Marseille-Port Mahon-Algiers (470 miles). To open next spring.

Fleet: Lioré cabin flying boats.

Compagnie Transaérienne de l'Est. Strasbourg.

Routes to be opened next spring:

(1) Strasbourg-Brussels-Antwerp (250 miles).

(2) Strasbourg-Frankfort a.M. (120 miles).

(3) Strasbourg-Zurich (90 miles).

Great Britain

Air Post of Banks, Lt. London.

Routes: London-Paris (223 miles). Bi-weekly.

Fleet: Westland 5-passenger airplanes (300 hp. Hispano-Suiza).

This route is to be extended next spring to Bordeaux, Madrid and Lisbon in conjunction with the Latecoere Line of Paris.

Air Transport and Travel, Ltd. (Airco Line). London.

Routes: London-Paris (223 miles). Two trips daily.

Fleet: Airco-18 8-passenger airplanes (450 hp. Napier); Airco-16 4-passenger airplanes (360 hp. Rolls-Royce); Airco-9 2-passenger airplanes (360 hp. Rolls-Royce).

Handley-Page Transport, Ltd. London.

Routes: (1) London-Paris (223 miles). Daily.

(2) London-Brussels (210 miles). Daily.

Fokker cabin airplane used on the London-Amsterdam air transport service

(3) London-Amsterdam (259 miles). Daily; temporarily suspended.

Fleet: Handley-Page W. 8 14-passenger and Handley-Page O-410 10-passenger airplanes for routes 1 and 2; Airco-9 and Airco-4 2-passenger airplanes for route 3.

Instone Air Line. London.

Routes: London-Paris (223 miles). Irregular.

Fleet: Vickers-Vimy 12-passenger and Airco-9 2-passenger airplanes.

Belgium

Syndicat National pour l'Etude des Transports Aériens. ("Sneta Line"). Brussels.

Routes: (1) Brussels-Paris (155 miles). Tri-weekly.

(2) Brussels-London (210 miles). Tri-weekly.

(3) "King Albert Air Line": Kinshasa-Stanleyville, Belgian Congo (1,125 miles). Three trips to be made monthly.

Fleet: Bréguet, DH 9, DH-4 and Salmson 2-passenger airplanes are operated on routes 1 and 2; Lévy (300 hp. Renault) flying boats are used on route 3.

Routes 1 and 2 will have daily service by next spring.

Holland

Koninglijke Luchtvaart Maatschappij (K.L.M. Line). Amsterdam.

Routes: (1) Amsterdam-London (259 miles). Daily.

(2) Amsterdam-Bremen (170 miles). Daily.

Fleet: Fokker F.II 5-passenger airplanes (185 hp. B.M.W.).

Germany

Deutsche Luftreederei. Berlin.

Routes:

(1) Berlin-Leipzig-Nuremberg-Munich (330 miles).

(2) Berlin-Swinemünde (110 miles).

(3) Berlin-Leipzig-Frankfort a.M. (270 miles).

(4) Danzig-Memel-Riga (320 miles). To open next summer.

Fleet: A.E.G., Albatros and Rumpler airplanes.

Lloyd Luftverkehr Sablatnig. Berlin.

Routes:

(1) Berlin-Bremen (195 miles).

(2) Bremen-Hamburg Copenhagen (240 miles).

(3) Bremen-Hamburg-Warnemünde-Malmoe (200 miles).

(4) Bremen-Gelsenkirchen-Frankfort-Munich (450 miles).

(5) Bremen-Amsterdam (170 miles).

Fleet: Sablatnig (260 hp. Mercedes) cabin airplanes.

Denmark

Danske Luftfahrtselskab. Copenhagen.

Routes: (1) Copenhagen-Hamburg-Bremen (240 miles).

(2) Copenhagen-Malmoe-Warnemunde (120 miles). These services have been suspended until the opening of spring.

Norway

Norsk Luftfartrederi. Kristiania.

Routes:

(1) Stavanger-Haugesund-Bergen (120 miles). Daily.

(2) Kristiania-Kristiansand (200 miles).

Fleet: Supermarine flying boats for route 1, Dornier (260 hp. Mercedes) flying boats for route 2.

Service on these routes has been suspended until next spring.

Portugal and Colonies

Macao Aerial Transport Company. Macao.

Routes:

(1) Macao-Hongkong-Canton (150 miles).

(2) Hongkong Swatow-Amoy-Foochow - Shanghai (1,100 miles). Projected.

Fleet: Curtiss H-16 and HS-2L flying boats.

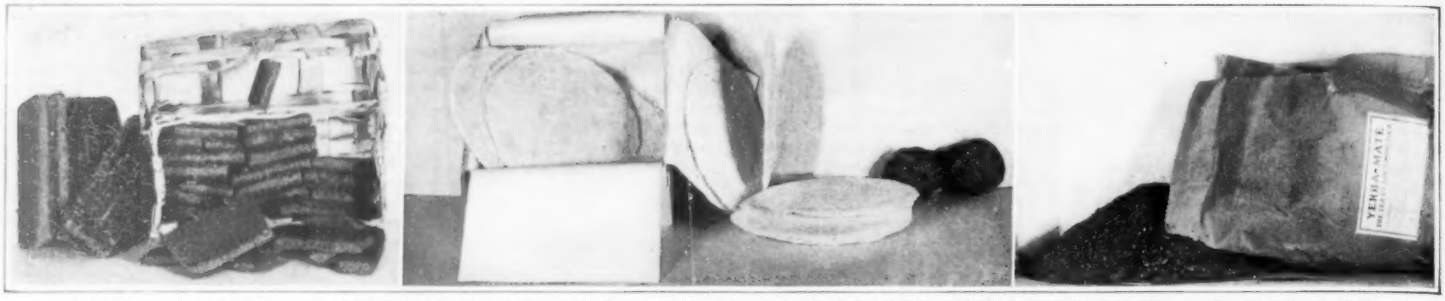
Colombia

Compania Colombiana de Navegacion aerea. Medellin.

Routes: Baranquilla-Medellin (400 miles). Irregular.

Fleet: Farman Goliath 14-passenger airplanes (two 260 hp. Salmson).

The foregoing catalogue of air services is, of course, subject to change from day to day. Indeed, since it has been compiled there may be several additions and some changes, since air transport is more or less a day-to-day affair and must remain so for some time to come. This is the first time that such a compilation has been undertaken. It is a basis for future compilations.



Left: Panocha bar- and tablet-sugar of South America, imported in many forms. *Center:* Cassava hard-tack bread disks, with the jumbo walnuts of Chile, ranging six inches in girth. *Right:* Yerba maté from Paraguay.

Tea-table items from south of Panama

Latin Foods in Old New York

Something Familiar for the Native of Any Quarter of the New World

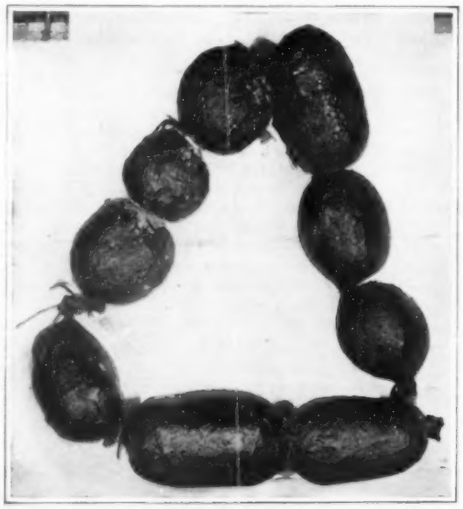
By L. Lodian

FROM the tortillas and tamales of Mexico and Venezuela, the sun-dried meats of Uruguay and Argentina, the dried bananas of Central America, the yerba-maté of Paraguay and Brazil, to the cassava bread of Colombia and Ecuador, the crude-sugar cones of Peru and Cuba, the choice nuts of Bolivia and Chile—such are but a few of the foodstuffs of Latin America currently obtainable in New York City. There are more diverse South American edibles on daily sale in old Gotham than will be found in any city of the continent to the south of us. Nor is this surprising.

A newspaper directory for 1920 lists more technical and class journals printed in Spanish within the boundaries of Manhattan than will be found in Buenos Ayres or Rio de Janeiro. These of course are chiefly concerned with the export business—or supposed to be. There are in particular a number of very creditable house organs printed in Spanish for circulation through the southern republics. Manhattan has also a Hispano-American institute the like of which exists in no other city of the new hemisphere, or even of Spain itself. In this metropolis of the new world will be found a greater variety of nationalities from the southern republics than anywhere south of the Rio Grande. Due to the presence of these people it is that there are imported to New York the various foodstuffs characteristic of each of the Latin countries. Obviously if we can buy in New York the major elements of the dietary of each of our southern neighbors, the totality of foreign products thus offered will be much greater than in one of the southern republics itself, which does not cater particularly to the tastes of visitors from the other side of the Andes. Of the many featureful and representative comestibles from the Latin table which the writer has purchased in the stores of New York, a few of the most striking are illustrated here.

Your Latin-American must have his black coffee in small cups, sweetened with the crude panocha sugar. The difficulty, when he is sojourning abroad, consists in getting the sugar. This serves a triple purpose: it helps clarify the coffee, it of course sweetens the drink, and it imparts a certain smooth, semi-syrupy gusto to the beverage which seemingly only the Latin knows how to relish. The illustration shows this sugar in bar form, as imported in curious woven one-kilogram containers of wood shavings—a box de luxe for the peon. These are retailed at about half a dollar here; in the countries of their origin they bring about one-third as much. The slab form is also obtainable at the leading import houses but is less convenient for breaking up. Then there are the quaint little crude sugar canes, weighing one kilogram each; also the irregular chunks that result from loose packing in barrels, followed by a settling of the mass into a rock-like whole which can be dissociated only by the pick-axe.

Another sugar obtainable in New York—if one is wise and lucky—is the palm product of the western coast. A recent consignment in 300-pound barrels at eighteen cents was taken up as soon as announced. This is the only palm sugar of the western hemisphere, and is a most delectable sugar of honeyed fragrance. The color is sandy; whereas the palm sugar of India and other Asiatic parts and the Nile Region is a brownish black of exquisite sweetness. It too is obtainable in New York and a few other American cities that harbor oriental stores.



The morcilla of Latin America, a pork product preservable for years

The recent scandalous price of sugar, and the gluttony for sweets seen in the enormous candy consumption, have a moral: the use of table sugars should be prohibited in the manufacture of confections. Meantime, those hard-pressed to get any sugar at all might remember that in the Latin-American and other exotic colonies of Manhattan they can always get a little brown sugar of delectable flavor. The Arabic colonies have their raisin-, palm-, date-, karob-, manit-, and imfi-sugars; the Japanese and Chinese their own particular versions; the Greeks their currant sugar. Some of these, despite the long journey which they must make to reach the exiles whose demand creates the supply in America, are retailed at a lower figure than the granulated product from Cuba. During the last three years of recurrent sugar famine, the writer was never without sugar, though never hoarding it; he was always able to purchase a little among one or another of the Spanish-American or diverse other alien colonies of Manhattan.

The morcilla is a sustaining pork product from the south, which can be kept for years, becoming very hard on the outside yet softening up somewhat after paring off the rind. These parings, by the way, go into the stew-pot or soup-pot. The morcilla is ideal as a sustaining food for mountain travel; due to its fat content, it is probably the most heating meat product extant. It is put up in various forms—in bologna shape, in ball form, or in huge bladders which a man can scarcely lift. It is eaten just as it is, having been already doubly steam-cooked and subjected to prolonged smoking; or it can be served reheated, which develops the flavor appreciably.

Voyagers versed in travel-craft, and in need of a temporary makeshift drinking cup, are wont to scoop out the meat from a morcilla ball and use the skin as a vessel. Ground coffee or maté is put in, boiling water poured on, and all is merry. The heat wrinkles the membrane slightly, but it can be used about a score of times before it actually ruptures.

While familiar enough among the Latins of Manhattan, the South-American tea known as yerba-maté (*ilex paraguayensis*) has made slow progress as a beverage with Americans, although on sale in some local stores for the past three or four decades. It is a product of Paraguay and Brazil—that from the former country being in best repute among connoisseurs. It occurs in commerce as a finely comminuted leaf; and in the cup or pot, after adding boiling water, the tiny leaf flakes float for a couple of minutes exactly remi-

(*Continued on page 177*)

Left: Sun-dried unsalted strip-beef from the Plata; always dry and clean to handle. *Center:* Maté from Brazil; the label shows the native way of sipping it through a tube from a gourd. *Right:* The unbroken shell is a Brazil-nut pod; the other is the sapucaia nut from the upper Amazon

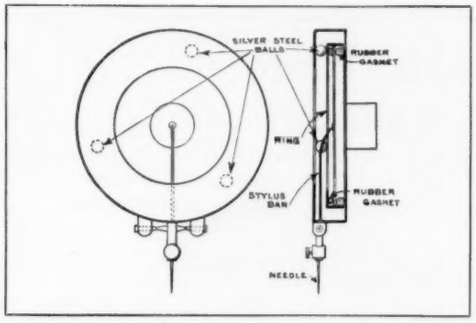
Food and drink from Brazil and her neighbors

A Phonograph That Is Always at Its Best

By R. G. Skerrett

NOTWITHSTANDING the much that has been done since the inception of the phonograph to make it capable of more fully and exactly interpreting the timbre and tone of the human voice and divers musical instruments, the results have been but partway successful. Not only has the phonographic reproduction lacked in the case of some instruments the distinctive characteristics that are theirs, but choruses and orchestrations have not been caught by the recording device so that they might be rendered as we are accustomed to hear them. Finally, the enunciation of the speaker and the singer has become muffled or indistinct through the processes of mechanical preparation of the records and their subsequent audible interpretation. Now, however, a very notable advance has been made in the art, thanks to the labors of Philo E. Remington, of the third generation of that family which has achieved a conspicuous position by reason of the fruits of its inventive cunning.

One of the reasons why the run of the reproducers on our phonographs do not fulfil the expectations of their makers is because the sound waves have not the opportunity, owing to the character of the diaphragm mounting, to acquire their full amplitude. In short, these waves, vital to faithful interpretation of the original source of sound, are more or less deformed or modified by the limiting facilities provided for the propagation of recording or reproducing vibrations. Mr. Remington has perfected a highly sensitive and elastically mounted diaphragm and has furnished, at the same time, a vibratory field, so to speak, that gives the sound waves full or undampened play. In this way, individuality of tone is assured, even though there may be many of these seeking to reach the ear.



Details of the diaphragm suspension that makes a single reproducer give best results for all tones

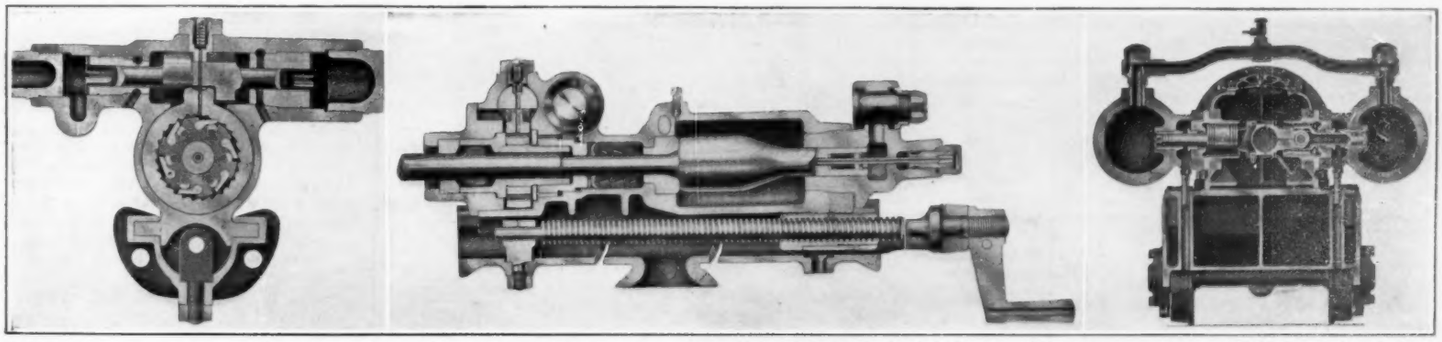
entire edge, and yet permits the mica disk that freedom of vibration which is required to enable it to respond and to transmit the tone waves resulting from any movement of the needle, no matter how slight. Here we find one of the difficulties surmounted which has previously hampered the faithful reproduction of a high soprano voice or any other tone source inducing short wave lengths. Many phonograph reproducers are so designed that it becomes well-nigh a physical impossibility in assembling them to hold the diaphragm in a way so that they will vibrate evenly throughout their surfaces.

In the Remington reproducing device, the insulating quality of the minute points of contact with the steel balls prevents what is termed, in musical parlance, "over-tones." The reason for this is that the tonal values of the reproduction are sent through the tone-arm instead of being largely transmitted from the exterior side of the reproducer through the mass of that arm. In brief, the sound waves are carried through the conduit furnished by the hollow tone-arm and, accordingly, follow the line of least resistance on to the tone-chamber of the instrument whence they issue to the auditor. Both the tone-arm and the tone-chamber are also sustained by 3-point supports and, therefore, they vibrate with an unusual degree of freedom.

Mr. Remington's phonographic reproducer is really an evolution of an ingenious loud-speaking telephone transmitter conceived and patented by Captain D. H. Wilson, a naturalized citizen of this country, a few years ago. The basic feature of the pioneer idea originating with Wilson was the use of numerous steel balls, arranged in two similar circles placed, respectively, above and below at the edge of the diaphragm. His construction made it feasible to insure an equal pressure on the diaphragm at all points of support and, at the same time, to permit the disk to vibrate freely. Mr. Remington became associated with Captain Wilson during the latter's experiments, and immediately realized how the phonograph could be benefited if the same principles were adapted to that instrument.

He promptly determined that the thing for him to do was to mount his phonograph reproducer in its own metallic case and then, in turn, to mount this on a series of ball bearings held within an outer case—the purpose being that the inner feature should rest, as it were, upon sustaining needle points provided for that purpose both at the front and the rear. So far, so good, but extensive research was needful to settle upon some of the vital details. In this quest for the most desirable bearing agencies, he tried out balls of various sizes and different numbers—using miniature spheres of glass, silver, steel, etc. Finally, he fixed upon three silver-steel balls, a quarter of an inch in diameter, symmetrically placed upon one side of the diaphragm and between it and the outer casing of the reproducer.

These balls are separated from the diaphragm by a metal ring which rests on a rubber gasket. This adoption of the 3-point contact, in combination with the insulating properties of the method of support employed, makes it practicable to keep the diaphragm in place under a uniform pressure applied around its



Right: Section of a wave generator developing 10 horsepower, taken through the spherical reservoirs that maintain the supply of fluid and equalize the forces on the crankshaft. *Center:* Longitudinal section of a rock drill operated by wave power. *Left:* A section through the mechanism that revolves the drill steel

The apparatus for driving rock drills by power transmitted by pressure waves through a pipe of water

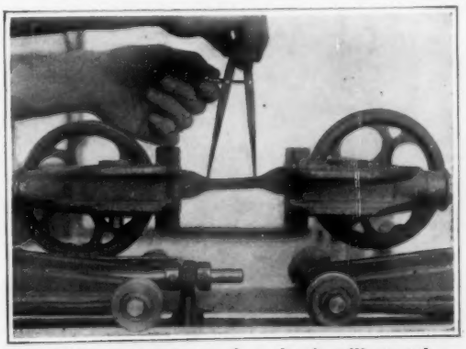
Power Transmission by Fluid Waves

BRITISH contemporaries are having a good deal to say, just now, about the application to peaceful purposes of the fluid-pressure system of power transmission, developed out of the invention of M. Constantinescu of a leverless and gearless means of synchronizing the trigger of a machine gun with the blades of the airplane propeller, so that the gun might shoot between the revolving blades.

In a sense the rather extravagant claims of a brand-new mechanical principle are justified, though we strongly suspect that the physicist, had he been appealed to, would have insisted with equal force that the principle was covered by pre-existing knowledge. We are in the habit of thinking of water as absolutely non-compressible, but we must realize that the fact is a little away from this; that when we apply pressure to this or any other fluid, there must be some reduction of bulk. If there were absolutely no compression in a column of water, a blow delivered at one end of the column could have but one effect—the delivery, instantaneously, at the other end of the column, of a blow of identical force. Even the rupture of the containing pipe at some intermediate point would appear out of the question, were the fluid absolutely lacking in compressibility.

The Constantinescu system, now being commercialized by a leading firm of British engineers, works through the fact that this compressibility exists. The pipe line is filled full, and blows struck the fluid at one end. These blows, instead of being delivered instantaneously through a rigid column, cause compression waves, as they are called, to traverse the pipe with a perfectly definite velocity approximately that of sound in water (4,800 feet per second). The actual motion of the water under the influence of these waves is a slight oscillation forward and back as the successive impulses arrive at a given point and pass it by. The obvious analogy is with the ordinary speaking tube, in which the air does not actually flow through the tube, but in which it does act as medium for the transmission of the sound waves. At the receiving end the wave impulses are picked up by a plunger, which is caused to reciprocate. And that is all there is to it, outside of the strictly engineering problems of proper design of the wave-producing apparatus and proper connection with the machine in which the power is ultimately to be used.

This machine to date has usually been a rock drill, or in some cases a riveting hammer. Here the plunger is used in simple fashion as a floating piston, and strikes a blow directly on the shank end of the drill steel or river snap. Flexibility in use is gained by means of a steel tubing of rather extraordinary character, which can be coiled up in a roll tight enough to be carried over the shoulder, but which presents joints that are entirely tight to the water, oil, or whatever other fluid may be employed. Coal-cutting and pile-driving equipment operated in this manner is also to be had. A more complete account of the new system appeared in a recent issue of the SCIENTIFIC AMERICAN MONTHLY.



Testing leather to see how far it will stretch under a given pull

How Much Will It Stretch?

THE average layman doubtless has heard the expression "tensile strength" and realizes that this forms the object of many tests; but he probably has a wholly false idea of just what is involved. He doubtless pictures the material under test being subjected to greater and greater strain until it is actually pulled apart, with the amount of pull necessary to achieve this end the sole numerical result of interest. The fact is, that even more than in the ultimate breaking point, technicians are interested in the amount of stretch which a given material will show under moderate strains, of the sort to which it may with some probability be frequently exposed. Our picture shows a sample of leather being carefully tested for stretch in this fashion; and we may remark that before it leaves the jaws of the little machine, it will be measured also for "reduction in sectional area."

With the Engineers of Industry

A Department Devoted to the Physical Problems of the Plant Executive

This department is devoted to business men, works managers, production engineers, and all other executives seeking the maximum efficiency in carrying on their work. The editor of this department will endeavor to answer all questions relating to plant equipment, factory management, and industrial affairs in general.

A wheelbarrow type loading platform during loading operations

Combined Street and Warehouse Truck

THE underlying motive of much of the inventive effort of the present time is the urgent necessity for reducing labor costs. This holds true not alone of manufacture as carried on in our factories, but of various means of transportation of the raw materials and the finished product as they move, let us say, from mine to factory, from factory to warehouse and from warehouse to consumer. Unquestionably, the greatest element in transportation costs is that due to handling and rehandling, and the production of any new form of crane, elevator, truck or motor truck that will cut down the handling costs is sure of a ready welcome, if it proves to be efficient and durable.

We present illustrations of a new form of truck which possesses the unique advantage that it can be loaded on any part of a warehouse floor, run under its own power to the elevator, and when it reaches the street, instead of transferring its burden to a larger motor truck, has been so designed that it can carry its own load through the streets and deliver it at store front, freight yard or steamship pier. A standard truck of this type will have a platform 4½ feet in width by 8 to 10 feet in length, the floor of the truck being about 2 feet above the ground. Its maximum capacity is about 5,000 pounds, its speed over a street or road with fairly good surface is from ½ to 10 miles per hour in a light condition, and from ½ to 7 miles per hour under full load.

Since one of the chief objects of the design is to get rid of hand trucking by enabling the truck to be run up to its load on the warehouse floor, it was necessary to obtain a very short turning radius. Mr. W. C. Brinton, who developed this truck, provided each of the four wheels with its own motor and mounted the unit, as thus assembled, upon its own independent vertical kingpin, as shown in the accompanying plan view. Our illustration shows the relative positions of the wheels when the truck is moving around a post or column, on a 6-foot 6-inch radius. To cut down the standing time of the trucks, a number of four-legged platforms are provided, mounted either upon a pair of wheels at one end or upon four castors, upon which the material is loaded independently of the trucks. The underside of the loading platforms is of sufficient height to allow the trucks to be run in beneath them. The platform is lifted, clear of the ground by means of four screw jacks, one at each corner of the platform, the nuts on the jack are operated by means of sprockets on an endless chain which engages all of them and is driven by a motor which is controlled by the driver of the truck. By this means the platform is lifted clear of the ground for transport by the truck. The wheels have rubber tires of exceptional thickness, and in spite of their relatively small size, no difficulty is found in traversing streets and roadways that are in any decent kind of repair.

Speaking of Ventilation

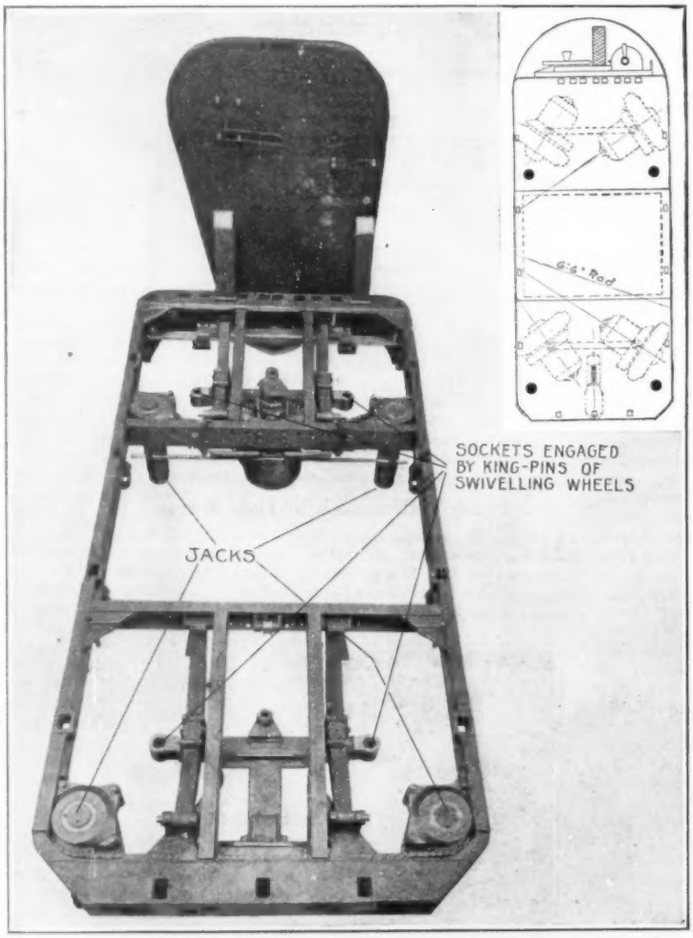
IN any room containing a considerable number of persons, the air is continually having its temperature raised and its relative humidity increased, by radiation and evaporation from the bodies and respiratory apparatus of the persons themselves. The oxygen is also being absorbed and the carbon dioxide content increased, and volatile toxic emanations from the bodies of the individuals present are tending to accumulate. It is plain, therefore, that the air in the workroom must be regulated in some intelligent way, if the human machinery that is housed there is to operate properly and efficiently.

Ventilation meets this requirement by changing the air in the room—removing the vitiated air and supplying pure, fresh air to take its place. There is always a certain amount of interchange going on between the inside and outside air, through leaks around doors and windows, and often in other ways; but this natural means of ventilation is usually inadequate, and when it does furnish a satisfactory amount of air, the system (if we may call it by such a name) is usually objectionable on the ground that it produces draft. Open windows are also objectionable for the same reason. Furthermore, it is usually necessary to close them in wet and cold weather.

An artificial ventilating system may operate by blowing fresh air into the room, or it may draw the vitiated air out by means of an exhaust fan. In the latter case, fresh air, entering through the doors and windows, or through specially provided inlets, will take the place of that which is withdrawn. A blower system, continues an authority in *The Travelers Standard*, has the following good features: (1) It gives positive ventilation, regardless of the prevailing outside atmospheric conditions; (2) the air leakage is mostly outward, so that the rooms are practically free from drafts and are more uniformly ventilated; and (3) the system can be readily changed to meet unusual requirements or conditions. There are objections to such a system, however, (1) because its work is rendered inefficient, especially in cold weather, if too many windows are opened (though this is also true of other artificial systems); and (2) the cost of installation and operation may be considerable. These objections are largely offset, however, by the great advantage accruing to the employees a d the employer, as already explained.

An exhaust or extraction system of ventilation is less costly to operate, because the vitiated air can be passed into stacks, where, by reason of its temperature being higher than that of the surrounding air, it will create a draft and help quite materially in keeping up the necessary circulation. The main disadvantage of the exhaust system lies in the lack of control over the supply of incoming air. A cheap extraction system, which is satisfactory in many cases, can be provided in a one-story building by the use of pipe ventilators extending through the roof to the outside. These pipes should be capped with cowls. Boards inclined at an angle of about 45 deg. should be provided at the top and bottom of the windows in the rooms, so that the incoming air will be deflected upward, thereby preventing drafts. As the outside conditions vary, the window openings may be regulated to supply the proper amount of air. A common fault with a system of this kind is that the pipes and cowls are often too small. For a room of 50,000 cubic feet capacity, the ventilating pipe should have a cowl at least two or three feet in diameter, to insure proper ventilation.

The best ventilating system is a combination of the forced and exhaust methods. Inlets supplying fresh air should be placed near the upper parts of the rooms, and outlets should be provided where they will insure a complete circulation of the pure air before it is removed. Under ordinary conditions, it is best to locate the outlets at or near the floor level, on the same side of the room as the pure air inlets. The incoming air should be propelled by fans through channels that can be cleaned easily; and the system should be constructed so that the air supply can be regulated to meet the requirements of both temperature and quantity.



Chassis of the truck showing the springs and sockets for the independent, motor-driven wheels, and the four jacks which raise the loading platforms clear of the ground. The insert is a plan view showing the independent, motor-driven wheels, in their relative positions when turning a sharp corner, such as moving around a post or column

Chassis and mechanism of the new electric truck

Loading platform, picked up by truck for transportation

A Helicopter for Military Purposes

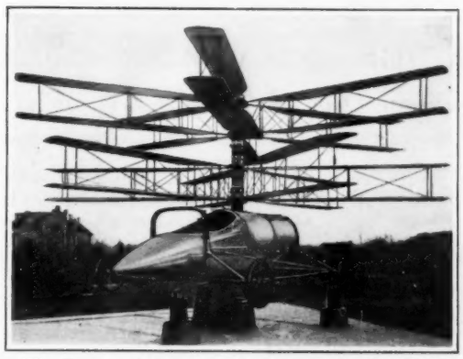
THERE was recently held at Barcelona, Spain, the first official trials of the helicopter invented by Pescara, an Argentine of Italian descent, for the benefit of a French military commission. This commission, which included the famous flier, de Romanet, made the following significant report regarding the Pescara helicopter:

"We have found Pescara's helicopter admirably constructed and we are certain that we shall be able to carry out all the tests intended and necessary with such a machine. All those which we have made gave us the full measure of force we expected. It is with the greatest assurance that we will continue the experiments, but we do not wish yet to try any definite flight tests. These will probably take place next month.

"What we can now state is that the construction of the helicopter is so good that it may be stated that the present machine gives promise of much greater chances of success than any that have been hitherto designed."

The Pescara helicopter follows the well-known scheme of two huge lifting propellers revolving in opposite directions about the same axis. The body of this machine is very much like a racing automobile, with the engine and radiator at the front end, and a tapered streamline rear. It is provided with a stout landing chassis. Mounted on this body is a vertical mast which carries the two horizontal or lifting propellers. Each propeller comprises six spokes which carry wings of biplane design. These wings are reinforced and wired so as to make the entire structure quite rigid. The propellers revolve at 200 revolutions per minute.

By means of a lever the operator of the new helicopter can tilt the mast and the propellers to any desired degree, causing anything from a direct upward flight to a horizontal flight. Furthermore, the operator can control the direction of rotation of the propellers, even to the extent of having one work against the other so as to make for a braking action. In this manner, so the inventor claims, it is possible to make very slow landings devoid of any danger, even when alighting on rough terrain. While in the event of engine failure there is admittedly insufficient wing surface to prevent a sharp drop, Pescara claims he has worked out a system of wing control which he says checks the speed of the descent.

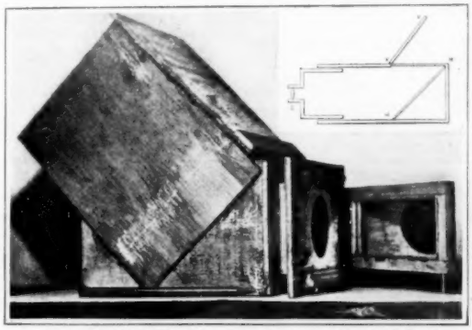


The Pescara helicopter which was recently tested by a French military commission

Finding Present-Day Uses for the Forerunner of Our Cameras

THE camera of today traces its lineage back to the middle of the sixteenth century, when an Italian philosopher, Battista Porta, exhibited his *camera obscura* to the crowds that flocked to his house in Naples. The Porta apparatus in its more developed state consisted of a pair of telescoping boxes as shown in the accompanying sketch, one containing the lens *O*, which could be moved back and forth for focusing purposes, a mirror inclined at 45 deg., *MM*, a piece of ground glass *MV*, placed in the shadow of the screen *VV*. The light entering through the lens was reflected by the mirror on to the ground glass. Or, if it was necessary to make a sketch of the image, a piece of paper was substituted for the ground glass.

Of course, with such a simple arrangement the image was reversed. Now to make the image as it should be, all that is necessary is a mirror mounted in front of the lens, as shown in the photograph, and inclined at 45 deg. This mirror can be mounted on a wooden frame and so hinged that it can be folded down when the apparatus is not in use. A further improvement on the Porta *camera obscura* is to provide a hood of the type shown, which can also be folded down when the apparatus is not in use. All in all, this improved model may be readily built by the average handyman, and it serves to study landscapes, engineering works, buildings and other objects on a small scale. If desired, such objects may be traced on paper. The *camera obscura* even at this late date may come in for no end of useful tasks, such as aiding the draftsman and the artist in reproducing any scene or object on drafting board or canvas.



Improved Porta camera obscura for studying scenes and objects, and (in insert) diagrammatic layout of original apparatus

Oxygen Testing of Steel

IN a new publication of the Bureau of Standards, Scientific Paper No. 350, "Equilibrium Conditions in the System Carbon, Iron Oxide, and Hydrogen in Relation to the Ledebur Method for Oxygen in Steel," is shown that mixtures of iron oxide and Acheson graphite are not, and mixtures of iron oxide with "cemented" iron or white iron (annealed or unannealed) are reduced at 900° C. by the carbon in them when hydrogen is passed over them at rates of 2 liters per hour or faster. Because of these facts it is probably impossible to determine by the Ledebur Method more than 75 per cent of the oxygen present in steels as ferrous oxide. The effect of rate of passage of hydrogen on the Ledebur oxygen content of certain steels is shown. This paper is now ready for distribution and any one interested may obtain a copy by addressing a request to the Bureau.

More Products for Cold Storage

AN extension in the scope of cold storage is occurring. It is not in time during which preserved products are held. Investigations into the number of years cold storage would "keep" turkeys, for example, proved naturally unpopular with the consumer. The new investigations have been commendable, and concern themselves with new products suitable for the process—fresh fruits, principally. Cold storage is of economic benefit when it takes surplus eggs in spring and carries them over to late fall and winter, when egg production is never adequate to consumption. It similarly is of economic benefit when it saves surplus fruits for out of season consumption.

A cold storage enterprise at Kansas City has carried its work with fresh fruits along to a commercial basis. Strawberries and other berries, cherries, plums, and tomatoes, have been kept frozen for six to eight months, and, taken out, have been declared fresh and full-flavored. One of the large bakeries had in this cold storage plant $20,000 worth of cherries which are now on the market.

The use of cold storage for such perishable fruits and berries logically follows up the pre-cooling investigations which have been successful in this country and Canada. Reducing the temperature of such perishables before shipment adds hundreds of miles to the distance they can be shipped, and results in improved condition on arrival.

As pre-cooling somewhat mitigates the formerly insuperable handicaps of the grower having ripe perishables to market, so cold storage for out-of-season consumption is more aid to him. There are obvious market-stabilizing possibilities in cold storage for strawberries, for example. It is a safe conjecture that these possibilities will in due time be exploited. The housewife ultimately—who knows—may be able to can fruits almost any season in the year.

Taking Down the Giant Ferris Wheel of Paris

IN the recent past there have been two worthwhile attractions in Paris for the tourists in search of big things, namely, the Eiffel Tower and the giant wheel. But today the latter, which has been proclaimed unsafe and a serious menace by the powers that be, is being taken down, piece by piece.

"La Grand Roue," as it is called, was completed in 1899 and opened to the public during the exposition of 1900. It measured 325 feet in diameter and was of remarkably light construction. Since then it has offered entertainment to tens of thousands of visitors to Paris, commanding, as it does, an excellent panorama of Paris. By last October, however, the authorities decided that the wheel was no longer safe, and they stopped its operation. More recently the owners of the wheel, finding no further use for their property in its usual shape, decided to dismantle it and to convert the cars and steel and cables into spot cash. And it is just as well, perhaps, for Ferris wheels have long since outlived their usefulness.

Copyright, A. N. Mirzoff

Left: Cars or cabins of the big wheel, which are now going to serve as huts for the inhabitants of the devastated regions. *Center:* "La Grand Roue" at the height of its glory, in 1900, during the Paris Exposition. *Right:* Looking up at the scaffolding and framework erected by the wreckers for facilitating the dismantling of the great wheel

How Paris is taking down its huge Ferris wheel, which afforded pleasure to visitors for twenty years

Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Simple re-railers applied to standard railroad rails by a wrecking crew

A Re-Railer for the Wrecking Crew

RAILROAD wrecking crews work by the minute rather than by the hour. That is to say, they must do their work as rapidly as possible, and minutes count heavily against them; for every minute lost on a leading railroad line represents a serious inconvenience.

In this connection it is interesting to note the simple re-railer invented by A. Freed of Quakertown, Pa., and depicted in the accompanying illustration. This re-railer consists of a single steel member which is fastened to the rail in the manner shown. Two re-railers are used, of course, one for each rail of the track. The shape of the sloping part of the re-railer is such that it engages the wheels of the rolling stock which is being pulled back on the track. The flanged wheels are carried up clear over the rails and then fall a short distance into their normal place.

The Two-Man Stereoscope

FROM France comes the two-man stereoscope, or an apparatus that permits two persons to see the same stereoscopic view at the same time. This device, which is the invention of Dr. André Chéron, gives new life to the stereoscopic picture, especially for instructional purposes.

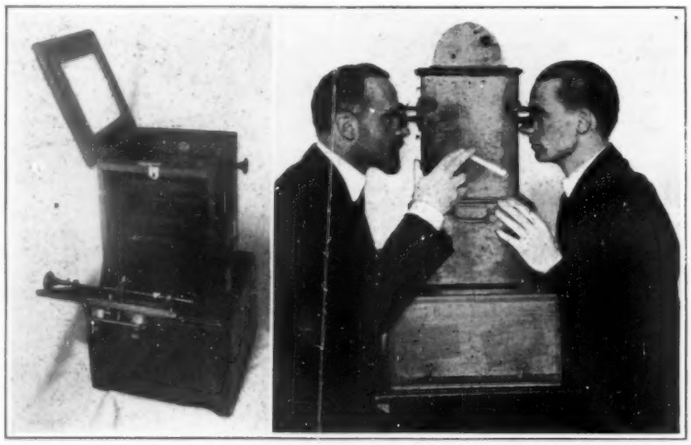
Briefly, the new stereoscope follows the general lines of the European models, so far as external appearance goes. However, it is provided with two pairs of eyepieces instead of one, and the light is placed at the top of the case. Now the essential characteristic comprises two clear glass plates which are arranged on either side of the stereoscopic slide at an angle of 45 deg. The stereoscopic slide, which is a transparency, is held vertically. Arranged horizontally back of each glass plate is a black screen, preferably made of black velvet. The light which falls on these glass plates from the light above is partly reflected back at right angles, passing through the transparent stereoscopic view, through the clear glass plate on the other side, and into the eyepieces opposite. The black velvet serves to absorb the rays which come through the transparent plates, so that the observer does not see the glass plate on his side through which pass the rays of the image. All the metal parts must be painted a dead black to avoid reflections. Obviously, the observers cannot both see the image in the same way, since one of them sees it reversed; but this appears to be a small disadvantage.

Turning the Switch to Press the Trousers

THE great problem of every man who takes pride in his personal appearance is to keep the crease in his trousers. This means frequent trips to the tailor, or the frequent manipulation of the family iron. There are certain presses and stretchers which are said to put a crease in trousers left in them overnight, but these devices generally presuppose that a crease already exists in the trousers and they merely serve to accentuate the crease.

From France comes the electric trouser press, which is said to solve the trouser crease problem for the fastidious dresser. The press, which is shown in the accompanying illustrations, opens up so as to permit the trousers to be carefully laid out. Special recesses are provided for the pockets. The press is then closed and electric current applied. After fifteen minutes the trousers are ready to be taken out and worn, with just as sharp a crease as if they had been handled by a skilled pants presser. No damp cloth or sprinkling is necessary with this device. The inventor explains that the latent moisture which is always present in cloth is sufficient, in combination with the electric heat applied, to make the crease.

The device consists of nothing more than electric heating units faced with an asbestos cloth and held in a two-part press, as shown. About 600 watts of electricity is necessary.



Two-man stereoscope, showing it opened to indicate the position of eyepieces, inclined glass plate and black velvet screen, as well as in use

What Happens to the Box When Slings Are Used to Unload a Ship

TWENTY boxes frequently constitute a sling load in transferring cargoes from ships to lighters. The weak point of many export boxes is the crushing of the top and bottom edges of the boxes due to the pressure of the slings, according to tests recently begun by the U. S. Forest Products Laboratory. The weight of the contents of the boxes when added to the weight of the container itself causes a heavy lateral pressure to be exerted by sling ropes and chains against the top and bottom edges of the outer layer of boxes.

Buying Pulp Wood by Weight

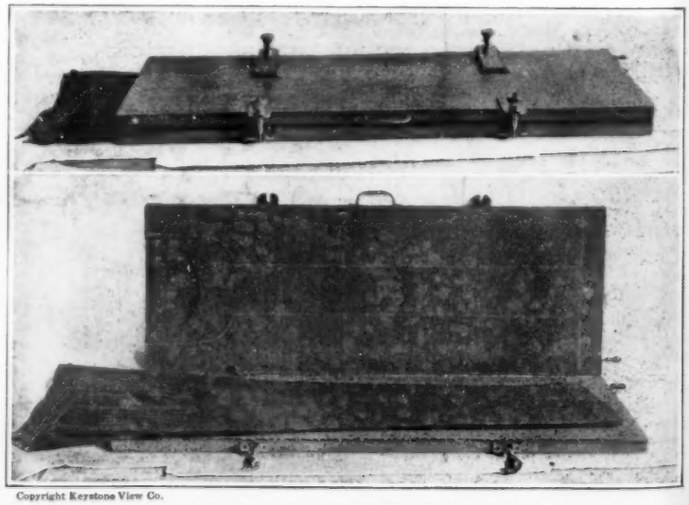
WORK done at the Forest Products Laboratory, in cooperation with the News Print Service Bureau, to obtain data on buying and using pulpwood on the weight basis indicates that such procedure would be very desirable. If such a thing proves possible the uncertainty as to the actual solid cubical content of the present cord would be eliminated and allowing for the percentage rot in wood by scaling would partly be done away with. Buying pulp-wood on the weight basis has the further desirable features that the industry could establish a sensible and rational cost accounting system and it will also be a decided stimulus to a more thorough technical control of all of the mill operations. The disadvantages, however, are that the seller of wood will have to be educated to this method of purchase, and at the present time since there is an actual shortage of pulpwood the mills will have to purchase according to the method desired by the seller.

A New Metallic Packing

WE are shown an interesting new packing material, of which the component elements are mica and babbitt metal. The patentee, B. W. Goodsell, an old designer of packings, has perfected the method of incorporating mica flour inseparably into the metal, as a part thereof; and has been able to achieve this result in plastic, twist and slab forms. He claims a double service as the result of this—100 per cent greater durability than by the use of the agencies generally employed as lubricants.

The plastic packing has as its base a granulated babbitt, into which is milled a new adhesive holding compound, and short bits of metal wire as the binding agent. While this combination is being hot milled, the mica is distributed evenly throughout the mass. The result is a packing, suited for all engine-room and marine service, according to the claims of the maker, and which he characterizes as to all intents and purposes of all-metal composition. It is equally suitable for rods, valves, rotary motors, etc.; and as the material never fuses, it can be removed and reused.

The twist packing is a second style, designed specially for automobile, truck and tractor pumps, where limited space generally obtains. In addition to the convenience of applying it, it is claimed that the packing is an absolute rust preventer on idle machines. The twist is composed of skeins of soft metal wires drawn to .007 inch diameter, spread, wax-filled mica-treated, then folded, compressed and twisted into the required sizes.



Electrically-operated trouser press for the home, shown in the act of pressing and open at the end of the operation

Shall We Have a National Trade-mark?

(*Continued from page 167*)

In this country, it will be remembered, the adoption of a national trade-mark began to be seriously urged soon after the outbreak of hostilities in Europe, when everyone was painting rosy pictures of the future of our export trade. The designation of American goods by a special symbol was regarded in many quarters as one of the most effective means of enhancing the reputation of our products abroad and of retaining the markets to be won.

The bill providing for a national trade-mark introduced in Congress in 1916, however, failed to pass, and that brought forward in 1918 met a similar fate. The latter was objected to especially because it would have made the right to use the national mark dependent upon licenses to be granted by the Secretary of Commerce. The effect of such an arrangement, opponents of the measure declared, would be to place the export trade of the country practically in the hands of one man. What form of legislation will now be proposed remains to be seen.

But if we are to have a national trade-mark, what, precisely, is the purpose that we should make it serve? All of those who favor the adoption of a national mark of some kind would not answer this question in the same way. Most business men who have studied the problem intelligently would probably say that a national trade-mark should be used simply to indicate that the goods upon which it should appear were of American origin. But representatives of the Bureau of Foreign and Domestic Commerce and some others have insisted that a national mark ought to stand as a guaranty by the government that the goods bearing it are up to a certain standard or that they are actually as described by the manufacturer. The difficulties of enforcing standards of quality for goods to be sent abroad and of checking up the honesty of exporters are obvious. In countries like France and Switzerland the situation is different: there the private associations controlling the use of the so-called national marks can exercise over their members a supervision wholly impossible for the government with respect to the exporters of the entire United States, and the fact that the volume of trade is comparatively small tends to simplify the problem. If we do adopt a national mark, it seems clear that we should not try to make it anything more than an indication that the goods on which it appears are made in the United States.

Those opposed to a national trade-mark of any kind contend, however, that, no matter what our own understanding might be abroad, the mark would inevitably be regarded as much more than a simple designation of origin. The average foreign buyer, they say, could hardly fail to take it as an assurance of high quality, and upon finding some marked goods below standard, as must often happen, since manufacturers of inferior articles would be especially anxious to use the mark, he would become prejudiced against American products in general.

Another argument vigorously pressed by opponents of the project as a whole, here as in Great Britain, is that the use of a national mark would gradually undermine the value of private trade-marks. Since both would appear together upon a given article, the presence of the official designation, it is declared, would of necessity detract from the importance of the private symbol in the eyes of the foreign consumer, who would ultimately come to identify the product by the former. Owners of old-established marks that have won high reputations in foreign markets urge this point very strongly, fearing that the use of a national mark

(*Continued on page 177*)

Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

Pertaining to Aeronautics

FLYING MACHINE.—C. ORSETT, P. O. Box 32, Belmont, Mass. The invention relates to a machine of the helicopter type. The object of the invention is to construct a machine which is not primarily designed with a view to traveling at great velocity, but which shall be capable of safely rising and descending in a vertical plane and capable of transporting passengers and merchandise without relying on an extremely high power, light type of motive power.

Electrical Devices

ELECTRIC LIGHT FIXTURE.—G. E. VILLABET, 1652 University Ave., New York, N. Y. An object of this invention is to provide an electric light fixture which is capable of a wide variation in design ornamentation and coloring, which will distribute and diffuse the light so as to give the desired illumination in all directions and yet overcome glare. A further object is to provide an attractive effect at a reasonably low price.

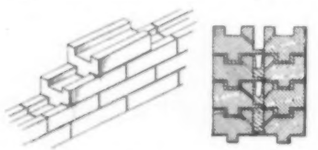
TELEPHONE RECEIVER.—J. C. KANE, 421 Crawford Ave., Detroit, Mich. This invention relates to telephone receivers of the character especially adapted for "radio" work, wherein a diaphragm is provided balanced in the magnetic field between the pole pieces, to reduce the stress and permit the use of a very thin steel diaphragm and a very powerful magnetic field.

Of Interest to Farmers

HAY RAKE.—W. KOUNS, Salina, Kans. Among the objects of this invention is to provide a hay rake in the form of an attachment which may be used in connection with any form of motor vehicle such as a motor truck, for the varied line of purposes to which rakes are put on the farm and in agricultural activities. A further purpose is to provide an attachment which may be easily connected or removed.

Of General Interest

WALL CONSTRUCTION.—E. H. KLEINFELDT, 29 Bradhurst Ave., New York, N. Y. An object of the invention is to provide a building block of such construction that it may be correctly, easily, and quickly laid to form a strong and durable wall of neat and attractive appearance, without requiring the exercise of skill on the part of the mason, thereby presenting labor saving features and reducing to a minimum any waste of building material. The block can be made for use in either single or double walls.



A PERSPECTIVE VIEW OF A SINGLE WALL AND A SECTION OF DOUBLE WALL

STIRRING AND DIPPING DEVICE.—E. and G. KENT, address C. E. Phenicie, 111 E. 34th St., Tacoma, Wash. The invention relates to a stirring and dipping device particularly adapted for stirring and dipping from receptacles containing milk and cream, and the object is to provide in a single device means for performing both operations. A further object is to provide of this character, which is strong and durable, and which may be manufactured and sold at a low price.

HAIR WAVER.—F. A. ALBERGHINI, address Florence Case, 309 W. 47th St., New York, N. Y. The invention has for a specific object to provide a waver in which the hair receiving members are placed in position against the head and the hair arranged thereon before the heating elements are applied so that the proper adjustment of the hair may be secured to produce a substantially natural wave in a minimum time without injury to the hair.

FIREPROOF CABINET.—R. R. IMHOFF, 281 Jackson Ave., Jersey City, N. J. This invention has particular reference to devices intended primarily, though not entirely, for the storage of inflammable materials such as sheets of celluloid. Among the objects is to provide a fireproof cabinet with double walls and intervening air space to reduce the liability of ignition of any inflammable material within the cabinet, by reason of fire or flame on the outside of the cabinet or spread of flame from within.

ALLOY.—F. MILLIKEN, corner William and John Sts., New York, N. Y. The object of the invention is to provide an alloy more especially designed as a high temperature metal and being especially adapted for use in forming apparatus used in handling and casting glass. The alloy consists of the following ingredients in approximately the following proportions: iron 8-12 per cent, copper 55-65 per cent, nickel 12-18 per cent, zinc 11-17 per cent and silicon about ½ to 1 per cent.

FRUIT STRAINER.—V. PLUGHOFF, Box 37, Huntington, Oregon. The invention relates to strainers adapted for use in straining juices for making jelly and jam, the purpose being the provision of a strainer which is adapted to be used in conjunction with a cooking vessel whereby the fruit may be strained directly into the vessel thus eliminating the necessity of removing the juices to some other vessel for a final cooking.

A VERTICAL SECTION OF THE STRAINER AND A COOKING VESSEL

WALL RESISTING THRUST OF EARTH AND WATER.—E. LACAZE, Calle Naiper, 671, Buenos Aires, Argentina. The purpose of the invention is the saving of building material in the construction of walls designed to resist by their own weight the horizontal thrust of the earth or of water, according to the invention such walls are erected by casting shaped walls of pure or reinforced concrete, in which the weight of the filling serves to substitute the weight lacking in the wall for assuring the stability of the same.

COMB.—O. R. ALTWEIN, Asheville, N. C. The invention relates particularly to combs designed for straightening short kinky hair, an object being to provide a comb having a hair of stationary parallel tooth members and between said members provide a movable tooth member with means for moving the same longitudinally to regulate the distance between the faces of the teeth so that any desired grip may be had, hence, when the comb is heated, the kinky hair will be straightened out as the comb is moved through it.

AUTOMATIC VENTILATING DEVICE FOR WATER CLOSETS.—A. J. GRITTON, c/o Sanatorium, Worthington, Minn. An object of the invention is to provide a device by means of which the bowls of water closets may be ventilated, rendering them more sanitary. A further object is to provide a system by means of which a fan is automatically set into operation while the closet is being used, and to prevent a back flow of the gases while the device is not in use.

Machines and Mechanical Devices

PRINTING ATTACHMENT FOR PHOTOPRINTING MACHINES.—T. G. COOPER, 119 E. Ashley St., Jefferson City, Mo. Among the objects of the invention is to provide a printing attachment for photoprinting machines arranged to automatically print identification characters and other legends on the back of the sensitized printing sheets during the printing thereof, with a view to identify the prints of each particular job, also to print the photographer's name on each print.

ENGINE DRIVING CONNECTION.—F. H. SIMONTON, 412 Audubon Ave., New York, N. Y. Among the objects of this invention is to provide in an engine drive connection utilizing the direct force of a reciprocating power member, a means which will permit the said reciprocating motion to be translated directly into a rotary motion without the use of small spring actuated members, thus eliminating the necessity for use of a crank shaft and a connecting rod as usually employed.

COAL LOADING DEVICE.—R. T. MCKEEN, 1501 E. 64th St., Chicago, Ill. The object of the invention is to provide a device by means of which coal may be economically loaded into cars at the mines. The device is primarily intended for use in coal mines using the room and pillar system and in which the coal is gotten out by under cutting with a chain machine. A further object is to provide a form of shovel which may be operated by power in a room having a relatively small height.

Musical Devices

TONE ARM BASE.—A. R. SPICACCI, 733 Lemott St., West Hoboken, N. J. The invention relates to talking machines, and particularly to a tone arm base which is simple and comparatively cheap to manufacture. Another object is to provide a base and tone arm construction to permit a free turning movement, while at the same time presenting a mechanical construction which will not readily get out of order and will wear for a long time.

PIANO TOOL.—R. C. BISHOP, 1030 E. 10th St., Ada, Okla. The invention relates to a tool used in the repair and regulation of piano actions, the object being the provision of such a tool which, although adaptable to innumerable uses in repairing and regulating piano actions, is especially designed for softening the felt of piano hammers and giving the correct shape at the striking point, thereby improving the tone quality.

Prime Movers and Their Accessories

ROCKER-ARM FOR VALVE-IN-HEAD MOTORS.—W. S. LEE, 211 Broadway, Paducah, Ky. An object of the invention is to provide a rocker arm which is comparatively noiseless, due to the fact that it contains a spring which takes up the play. A further object is to provide a two-part rocker arm having a spring between the two parts, said spring being housed within the body portion of the rocker arm in such a manner as to be securely retained.

CARBURETOR.—A. A. HANSEN and E. M. STUKAS, Clinton, Iowa. The invention has for its general objects to provide in the mixing chamber of a carburetor mechanical means for causing the liquid fuel to be sprayed into the chamber and to be further acted upon centrifugally for producing an extremely fine mist so that a better fuel mixture can be obtained.

FEEDER.—J. L. STEWART, 2831 Peabody, Bellingham, Wash. The object of this invention is to provide a feeder especially adapted for feeding boiler compounds, wherein the rate of feed is controlled directly by the velocity of the feed water in the feed pipe. With this device the feeder may be used to feed a compound of higher or lower specific gravity than water.

Railways and Their Accessories

TROLLEY POLE ARRESTER.—R. B. SPIKES, Fort Bragg, Cal. This invention has for its object to provide mechanism in connection with trolley poles for automatically pulling down the pole when the circuit is broken to prevent the breaking of the trolley wire and injuring the pole. When the trolley jumps the wire a spring rotates and the rope is wound up to pull down the trolley pole.

TAKE UP DEVICE.—R. B. SPIKES, Fort Bragg, Cal. This invention relates to mechanism for automatically taking up the slack in the rope and for permitting slack to run out, as the pole moves up or down with the varying height of the wire, and is especially designed for use with the trolley pole arrester, mentioned above.

CAR DOOR FASTENER.—W. KANE, 141 Margaret St., Sarnia, Ontario, Canada. The object of the invention is to provide a car door fastener which is easily operable to secure or release the door, being adapted to secure the door in either closed or partly open position, which is effective to maintain the door closed against the action of the shifting load, which is of simple and durable construction and reliable in operation.

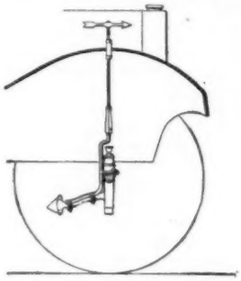
Pertaining to Recreation

COASTER.—O. P. HERWICK, 1025 South Jersey St., St. John's, Portland, Ore. The invention relates to coasters, or so-called skipmobiles, and has reference more particularly to propelling or traction means for this class of vehicle. According to the present invention, it is proposed to equip a coaster such as a skipmobile with a mechanical means for propelling the device without requiring the manipulator to slide his foot over the surface of the ground.

TOY GRASSHOPPER.—G. E. FORD, Olden, Texas. The purpose of the invention is to provide a toy of this character in which the mechanism for effecting the hopping or jumping is adapted to be released automatically after the mechanism has been set so that the toy can be placed upon a table or other suitable support before it is actuated.

Pertaining to Vehicles

WHEEL ANGLE INDICATOR.—C. H. LUCK, Box 15, Madera, Cal. The invention relates to a device for enabling the chauffeur or other operator of an automobile to ascertain by means of an appropriate indicator carried by the machine the angular position of the front wheels and movable parts immediately associated therewith. The indicator is of the type known as a plane which will indicate graphically the precise planes in which the wheels extend.



A VERTICAL SECTION OF AUTOMOBILE EQUIPPED WITH INVENTION

AUTOMOBILE TOP.—E. L. CRONEMEYER, 93 San Jacinto St., Redlands, Cal. An object of the invention is to provide a collapsible top which is especially adapted for use on roadsters, touring cars or other vehicles, also motor boats, and which can be easily and quickly operated by anyone, either to position the top in operation or telescope the same and house the top in a dust and waterproof compartment in the car body.

ANTI-SKID ATTACHMENT.—S. C. SHERRY, Park Ave., West Englewood, N. J. An object of this invention is to provide an attachment which is particularly adapted for use on Ford cars and which when secured to the drive wheel will prevent slipping in snow or mud. A further object is to provide an attachment which can be readily secured as occasion may require, and which can be manufactured and sold at a reasonably low price.

FLUID CLUTCH.—G. SHIRK, 154 E. Norwich Ave., Columbus, O. This invention aims to provide a clutch which is particularly adapted to be utilized in connection with vehicles such as automobiles, and when applied to a comparatively light automobile, to result in the dispensing of the various gears used to vary the speed of the driven shaft with respect to the driving shaft. When this clutch is applied to heavier cars, such as trucks, it will be necessary to provide only a single intermediate speed.

END GATE FOR DUMPING TRUCKS.—H. MECKING, 223 W. 66th St., New York, N. Y. The invention relates more particularly to power driven dumping trucks, its object is to provide a self-opening gate or tail-board normally locked in closed position and adapted to automatically move into open position on swinging the body into dumping position, and to allow rocks to be passed out of the wagon body without interference by the gate or tail-board.

MUFFLER COVER.—G. H. PADGETT, Pine Castle, Fla. The invention relates to automobile exhaust mufflers, and particularly to the outer shell and means for permitting such shell to expand under certain conditions, the object is to provide an outer shell which may be removed or replaced without the removal or disturbance of the muffler ends, at the same time provide a shell which will be as strong as the ordinary outer shell, and equally effective.

Shall We Have a National Trade-mark?

(*Continued from page 175*)

might eventually destroy the good will which they have built up abroad by long effort and at great expense.

It is to be observed that the objections stated are usually made against a national trade-mark in the strict sense of the term and not against the use of a legend in the form of a plain statement of origin, like "Made in U. S. A." In fact many of the most active opponents of the national trade-mark project have advocated the adoption of such a legend to be placed upon all goods exported, subject, perhaps, to certain reasonable restrictions.

A few months ago the British Merchandise Marks Committee, which had been appointed to consider various questions relating to trade-marks, reported that in its opinion no experience has yet been gained anywhere from which deductions as to the probable utility and effect of a national trade-mark for the United Kingdom or the British Empire could safely be drawn, and that in the absence of general agreement among the business men concerned there are grave objections to the adoption of such a mark. The majority of American business men would probably regard this as the sensible view to be taken in this country.

Latin Foods in Old New York

(*Continued from page 170*)

niscent of the floating weed life of those tranquil village ponds of boyhood days. The flavor is a quiet one—as of an Indian tea made with city-caught rain-water. Everybody knows this peculiar taste.

Among some of the Latin cafés in Gotham you can get the infusion thus; or served in a gourd, with bombilla—a tube to imbibe the essence through, for by this method the maté really is an essence, not sufficiently diluted to be termed a beverage. Maté is imported in rawhide bales, in barrels, and in cases filled with one-pound sheet-metal or cardboard containers, ready for the retail trade. The writer has been familiar with maté for the past three decades, both in the land of its origin and here, and has found it best when used as a blend with Asiatic teas. To Ceylon and Java teas, for instance, it imparts a suggestive suchong or kangu flavor—if your imagination is sufficiently active.

The maté tree is at the same time one of the most beautiful shade trees of tropical America; and many a Paraguayan and Brazilian rancher has only to stroll into his well-shaded patio to cull a handful of leaves for his inevitable maté infusion. It is used with a little raw sugar —never any such superfluities as milk or cream.

Tasajo is the sun-dried meat from the abattoirs of Uruguay, Argentina, et al. It is obtainable either salted or unsalted; the approved modern practice is to sun-dry it quickly, without a particle of salt—but this modern practice is nothing really new, being only a copy of the oriental saltless curing of meats. Salting is partly destructive of the nutritive properties of meats, to the extent that, in desalting (as by water-soaking), nutritive juices are washed out and wasted. Perfect preservation can be attained without the presence of salt.

There is a huge annual import into Manhattan of tasajo—some two thousand tons —far beyond any local consuming needs. Yet it is almost all snapped up as soon as it enters. This is because the dealers in shipping supplies requisition the greater part for the use of the crews—so South-American tasajo is carried over the seven seas, mostly for the crews of sailing ships.

It comes in many forms—strip, lariat, whole sides, paper-thin translucent sheets (one of its best varieties), as a coarse meal in sacks—the latter somewhat akin to a coarse Indian meat meal. The strip is made from the sides, cut in one continuous length and zig-zagged over long lines to dry in the sun; the desiccation is usually complete in half a day, the bright red flesh quickly turning black and hard. Packed away in cases, it retains well its meaty odor, without even a suggestion of taint. Opening a case, a novice might think it was so much rope. The lariat form of tasajo resembles so much narrow pulley-belting—since for space economy it is tightly coiled like belting.

The great advantage of tasajo is that it never has a trace of bone or other waste in any of its forms, even bits of fat only occurring by chance. Eaten dry as it is—a common practice with the natives —tasajo is of good flavor, with appetizing meaty odor. But it chiefly figures in soups. Prior soaking in the same water in which it is later boiled will make it tender almost to the state of gelatine.

Kasabi is a native Indian word applied to a root legume common throughout tropical America from which the breadstuff called cassava is made. The tuber has some fifty different names and spellings in its various local habitats, but the Haytian patronymic given and the anglicized cassava are the best known. This is the daily bread of millions all over Latin America. It is regarded as the original bread of the western hemisphere—the next oldest being the maize tortillas. Wheat bread is an introduction of modern times, as ages go, in the western hemisphere; while rye bread is unknown even yet south of the Rio Grande.

Cassava is in fact a bread hardtack. It has not a particle of sweetness, as the word cake sometimes used in designating it might suggest; but it has a slight potato flavor. Many might pronounce it insipid, since salt or yeast or other leavening agents are never used in the baking. The color is usually a beautiful cream-white; the disks are always thin, and are baked in sizes ranging from six to twenty inches in diameter. The bread is at once nutritive and feebly aperitive, like whole wheat bread; hence its use in preference to any other bread by the aged among the natives. Cassava has been imported and sold in Manhattan—principally among the Spanish-speaking—for the past half century or more.

Little known nut wares from Spanish-America are the sapucaia nuts from the Amazon and Orinoco. These are about the size of Brazil nuts, but with wrinkled shells. The nut meat has a flavor that combines those of sweet almonds and filberts. It is one of the most economically worth-while nuts of the globe. It is sometimes called the nut of paradise, in reference to the primeval character of the upper Amazon forests where it originates.

The jumbo walnuts of the west coast are sometimes so big that the measuring tape reveals a girth of six inches, more or less. These huge nuts are always choice and meaty. The empty shells are sometimes hinged with a small fragment of thin leather glued on, and thus used for tobacco pouches, coin purses, etc.

The singu, or little baby cocoanuts from Chile, no bigger than nutmegs, yet with the characteristic three eyes and half a thimble full of milk, are worthy of passing mention.

There is too a big import of luscious tropical fresh fruits in season—as the custard apple, eaten with a spoon; the mango; the sapodilla; the guava, for preserving; green cocoanuts with a beautiful glossy flush, imported for their distilled-water-like content, a most refreshing drink; and some two-score other fruity delectables.

In fact, no visitor to Manhattan from any corner of South or Central America or the West Indies need feel that he is a stranger in a strange land so far as his food is concerned; for whatever his country, he can find in New York most of its good things to eat.

NEW BOOKS, ETC.

AN EPITOME OF HYDROTHERAPY. By Simon Baruch, M.D., LL.D. Philadelphia and London: W. B. Saunders Company, 1920. 8vo.; 205 pp.; illustrated.

As the author of the first original work on this subject in the English language, Dr. Baruch commands attention in his latest contribution to this important branch of remedial treatment. Charging that costly hydrotherapeutic instalment often fails to achieve its full possibilities, he sets forth the laws of shock and reaction, stresses the necessity for precision, and details the procedures directed toward general effects as well as those adapted to various diseases. The architect, as well as the physician and nurse, may profit by the instruction.

THE PRIMER OF SHORTHAND. By Jerome B. Howard. Cincinnati: The Phonographic Institute Company, 1920. 16-mo.; 99 pp.; illustrated.

The author, known to Pitmanic writers through his widely-used, "The Phonographic Amanuensis," has produced in this little book a distinct aid to the beginner. It deals only with monosyllables; that portion of the system employed in writing words of one syllable is thoroughly expounded, with numerous exercises in their use.

MATHEMATICS FOR ENGINEERS. Part II. By W. N. Rose, B.Sc. New York: E. P. Dutton and Company, 1920. 8vo.; 419 pp.; illustrated.

This volume completes a work directed toward strictly practical ends. It is mainly devoted to the differential and integral calculus, with chapters on spherical trigonometry and mathematical probability. The treatment is based on algebraic principles, amplified and explained by graphic proofs and constructions. The various branches of mechanical and electrical engineering call for applications of the calculus that are here exampled with commendable clarity. The two voumes furnish all mathematical work needed in all branches of engineering science.

THE NEED OF AUTOMATIC TRAIN CONTROL. By W. M. Camp. Chicago: The Railway Review Company, 1920. 8vo.; 64 pp.

The editor of the *Railway Review* in this pamphlet discusses accidents, signaling, and block systems, and summarizes the development and present status of automatic train control. The various systems of, and experiments in, automatic control are described, and some consideration is given to costs. The digest is worthy of wide circulation.

GAS WARFARE. By Edward S. Farrow. New York: E. P. Dutton and Company, 1920. 8vo.; 253 pp.

Gas, which turned the war into a battle of chemists, is likely to be utilized to even more terrific effect in any future conflict. As instructor at the United States Military Academy, the author had access to official records, and his book covers the various toxic gases, defense equipment, tactical employment of gas and chemical shells, hand grenades, and the manufacture, storage and transport of chemical weapons and equipment, with the duties and organization entailed by their use. It is a text for the soldier-student.

THE FIELD MANUAL. By Arthur Lovat Higgins, B.Sc. New York: Isaac Pitman and Sons, 1920. 12mo.; 938 pp.; illustrated.

In the training of engineers, surveying must be so presented as to meet the practical demands of varying circumstances. This is the aim of the present noteworthy text, which embraces the gist of British and American practice and forms a systematic digest of methods and operations, with field problems for use in surveying courses. The use of chain, level, theodolite, sextant and compass is developed in detail, the section on "The Office" has much sound instruction on scales, maps, and calculations, and an appendix carries the necessary formulæ and tables.

MOTION STUDY FOR THE HANDICAPPED. By Frank B. Gilbreth and Lillian Moller Gilbreth, Ph.D. New York: E. P. Dutton and Company, 1920. 8vo.; 165 pp.; illustrated.

It has been proved that those crippled by war or industry may, by proper training, again take a useful place in the world's work. Two leading experts in the field of motion study here lay a complete system before us. By subdividing the field of the motion picture into squares, and introducing a continuous torque clock, time and distance are made to exhibit mutual relations, and we are enabled to produce a simultaneous motion chart. The animated diagram is another means of efficient study and teaching. The book tells precisely

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what has been done in this way, and how and why to do it, and solves many problems presented by the crippled.

COMMON SCIENCE. By Carleton W. Washburne. Yonkers-on-Hudson, N. Y.: World Book Company. 8vo.; 390 pp.; illustrated.

To tell children what they want to know is to lead them to want to know what they should know; this is a new kind of high school text based on that belief. It answers 2,600 questions asked by real children; these are classified by the author according to the scientific principles involved, so that the resulting text has unity and sequence. A "Manual of Information" for teachers, in pamphlet form, has laboratory lay-outs and a list of the needed supplies.

VOCATIONAL ARITHMETIC. By Clarence E. Paddock and Edward E. Holton. New York and London: D. Appleton and Company, 1920. 12mo.; 232 pp.; illustrated.

The requirements of the vocational school and the shop call for an arithmetic especially adapted to practical purposes. Two experienced men, skilled in engineering practice and the teaching of that practice, here present the various branches of arithmetic in the simplest possible way, and set numerous every-day problems representative of those encountered in shop work, carpentry, foundry work, masonry, and excavation.

THE AUTOMOBILE OWNER'S GUIDE. By Frank B. Scholl. New York and London: D. Appleton and Company, 1920. 12mo.; 338 pp.; 154 illustrations.

The selection of and care for the car that best suits the purpose for which it is destined is a matter that might well be given more consideration than it generally receives. This Guide will help the buyer to pick the right car, to drive it properly, and to keep it in good repair. The instruction is conversational, expressed in the simplest form, yet thoroughgoing. The author's wide teaching experience in peace and war has enabled him to turn out a very practical manual.

AMERICAN GUNS IN THE WAR WITH GERMANY. By Edward S. Farrow. New York: E. P. Dutton and Company, 1920. 8vo.; 223 pp.

The combination of science, engineering and industry that, during the war, enabled us to supply a catalog of 100,000 separate ordnance items, establishes a "new American record" of which we may well be proud. Major Farrow outlines the staggering problem as it was handed to us, deals in separate chapters with rifles, machine guns, trench weapons, heavy guns, and railway and motorized artillery, and shows how new and complex devices were designed and produced in the face of almost insuperable obstacles.

THE DAWN OF MODERN MEDICINE. By Albert H. Buck, B.A., M.D. New Haven: Yale University Press, 1920. 8vo.; 288 pp.; 37 illustrations.

In the latter half of the eighteenth century the science of medicine witnessed a remarkable revival. With the aid of old French, English and Latin treatises, Dr. Buck reconstructs conditions in western Europe, and describes the personalities and activities of those to whom the surge forward was due. The work is illustrated from old prints and paintings, and holds as much interest for the intelligent layman as for the physician and student.

AMERICA AND THE NEW ERA. Edited by Elisha M. Friedman. New York: E. P. Dutton and Company, 1920. 8vo.; 500 pp.; illustrated.

In the revaluation of standards following the shock of war, questions of social and political adjustment are no less insistent than those of industry. This symposium lays before the thoughtful man the conclusions of some of the foremost students as to the real effects of the war, the illumination of prewar conditions, and the development of new ones. The work is a worthy sequel to "American Problems and Reconstruction," which dealt with economic and financial problems.

STARTING AND LIGHTING TROUBLES, REMEDIES AND REPAIRS. By Harold P. Manly. Chicago: Frederick J. Drake and Company, 1920. 16mo.; 459 pp.; illustrated.

Any repairman with some slight knowledge of electric lighting and starting principles will be aided by this manual to a complete mastery of diagnosis and adjustment. Trouble location charts are followed by approved tests for determining the kind of fault existing; this section includes electrical testing equipment and its use. The final section consists of diagrams of both internal and external wiring, with the characteristics of and specifications

for each system. Of course the manual will be equally helpful to the owner who is his own repairman.

AMIENS BEFORE AND DURING THE WAR. Milltown, N. J.: Michelin Tire Co., 1920. 8vo.; 56 pp.; illustrated; maps and plans.

The traveler is told just what he should look for in Amiens, from its perfect Gothic cathedral to its macaroons and potted duck. Nine shells hit the cathedral, but with little damage. Its wonders are pictorially unfolded, as are those of the Picardy Museum, and in Rheims is the oldest playhouse in France. There is much information for the motorist.

THE MERCHANT MARINE MANUAL. By Capt. Eugene E. O'Donnell. Boston: The Yachtsman's Guide, 1918. 16mo.; 293 pp.; illustrated.

This collection of nautical information was primarily intended for apprentices on our training ships; but all engaged in seafaring occupations will find its hints on seamanship, safety, sailing rigs, design, marine engines and nautical instruments productive of a better knowledge and mastery of their duties and an aid in passing examinations for higher grades.

THE MICROBIOLOGY AND MICROANALYSIS OF FOODS. By Albert Schneider, M.D., Ph.D. Philadelphia: P. Blakiston's Son and Company, 1920. 8vo.; 262 pp.; 131 illustrations.

While this text bears chiefly upon military requirements, all food analysists may profit by its crisp yet comprehensive instruction. It includes the microanalytic examination of water and other beverages and gives a working basis for finding the decomposition limits of food by the same direct method. As combined text and laboratory guide, it is adapted to college needs; and it proposes food ratings founded upon years of solid experience, with an endeavor to be fair both to manufacturer and consumer. The close relation of suitable food to race welfare makes this a subject of great importance.

INVENTIONS. Their Development, Purchase and Sale. By William E. Baff. New York: D. Van Nostrand Company, 1920. 8vo.; 230 pp.

Profitable marketing of his invention is the goal of the inventor—a goal seldom obtained; for invention and salesmanship are qualities rarely found in one individual. This book sets forth broad business principles and contains many suggestions for interesting capital, choosing a partner, and engaging in business for oneself. Other vital questions are handled. What is my patent worth? Just what privileges does it confer? What are its best talking points? These are answered in a manner that should set the feet of the average inventor in the right path, and enable him to avoid many mistakes.

DYNAMIC SYMMETRY. The Greek Vase. By Jay Hambidge. New York and New Haven, Conn.: Yale University Press, 1920. 4to.; 161 pp.; illustrated; 16 plates.

The later, and better, Greek design abandoned the linear unit of measurement, which produces "static symmetry," for a method based upon area, which produced the exquisite vase we now know as a striking example of "dynamic symmetry." To such conclusions the author's deep study has led him. This beautiful book recovers the technical methods of classic Greece and shows the correspondence of their results with form arrangements in plants, tracing both types of form to a natural law that affects design as perspective affects realistic representation.

CERAMIC CHEMISTRY. By H. H. Stephenson. London: Davis Brothers, 265 Strand, W. C. 8vo.; 91 pp.

The questioning of the conclusions of Seger and Berlin by the newer school of ceramists is reflected in this work. The author regards ceramics as highly suitable for college study, in that it provides a natural means of transition from geology to chemistry, and unites these branches with mathematics, physics, and engineering. The text discusses geological origins, and carries the student through all processes from clay analysis to firing the ware and testing the finished product.

MOTOR CAR UPHOLSTERING. Philadelphia: The Hirst-Roger Company, 1920. 8vo.; 180 pp.; illustrated.

The upholstery of a car ministers to two needs, appearance and comfort. The aim here is to familiarize the student with the technical and artistic requirements of all-round trimming, a trade that offers a remunerative occupation to the ambitious man with some creative imagination. The book makes him acquainted with the shop, materials, tools and methods, plain and tufted work, and fitting and finishing. It is a distinct aid toward the neatness, comfort and durability that mark the work of the successful designer and trimmer.

THE SUPER-ICARUS. By Leslie Reiser, Boston: The Roxburgh Publishing Company, Inc., 1920. 8vo.; 141 pp.

A superman and a transcendentalist clash in this dialogue. Shrewd hits are delivered by both combatants, and the newer concepts of matter, energy, time and space, of the ether, the fourth dimension and relativity, are ingeniously woven into the argument in terms that the thoughtful reader can follow and understand.

COMPRESSED AIR POWER. By Albert W. Daw and Zacharias W. Daw. New York: Isaac Pitman and Sons. 8vo.; 375 pp.; 75 illustrations, 40 tables.

The use of compressed air is continually being extended. This comprehensive study deals with its compression; expansion, exhaust and flow, giving worked-out examples. It investigates the air lift pump and mathematically analyzes its action; types of compressor valves, controls, and receivers are illustrated and described; and the return air system with its great potentialities is explained at length. All concerned in the design and use of compressed air plant and machinery may find here forceful instruction, exact information, and practical suggestions.

THE LEADING FACTS OF AMERICAN HISTORY. By D. H. Montgomery. New York and Boston: Ginn and Company, 1920. 8vo.; 500 pp.; maps and illustrations.

This school text is so well known that it is only necessary to say that the new edition incorporates more recent events in the same spirit of simplicity, accuracy and impartiality. The significant facts of history are marshalled with unerring judgment, and are made to march before the reader's eye in a colorful procession. Thorough revision is discernible, and our part in the great war is briefly indicated. The illustrations and maps have been carefully selected.

GAGE DESIGN AND GAGE-MAKING. By Erik Oberg and Franklin D. Jones. New York: The Industrial Press, 1920. 8vo.; 310 pp.; illustrated.

There is a distinct relationship between the gages used and manufacturing costs. This work insists that tolerances be carefully based upon working requirements, since there is such a thing as unnecessary and costly accuracy. The treatise presents the development of gaging systems for interchangeable production, the design of numerous types, precision machining operations, and the modern devices for gage measurement. It emphasizes the importance of the relation between the gaging system and the design of jigs and fixtures, establishes basic principles, and skilfully sets forth methods of measuring and testing with generous illustrations.

DURUY'S HISTORY OF FRANCE. Translated by M. Cary. Edited by James F. Jameson. Continued to the year 1920 by Mabell S. C. Smith. New York: Thomas Y. Crowell Company, 1920. 8vo.; 792 pp.; colored maps.

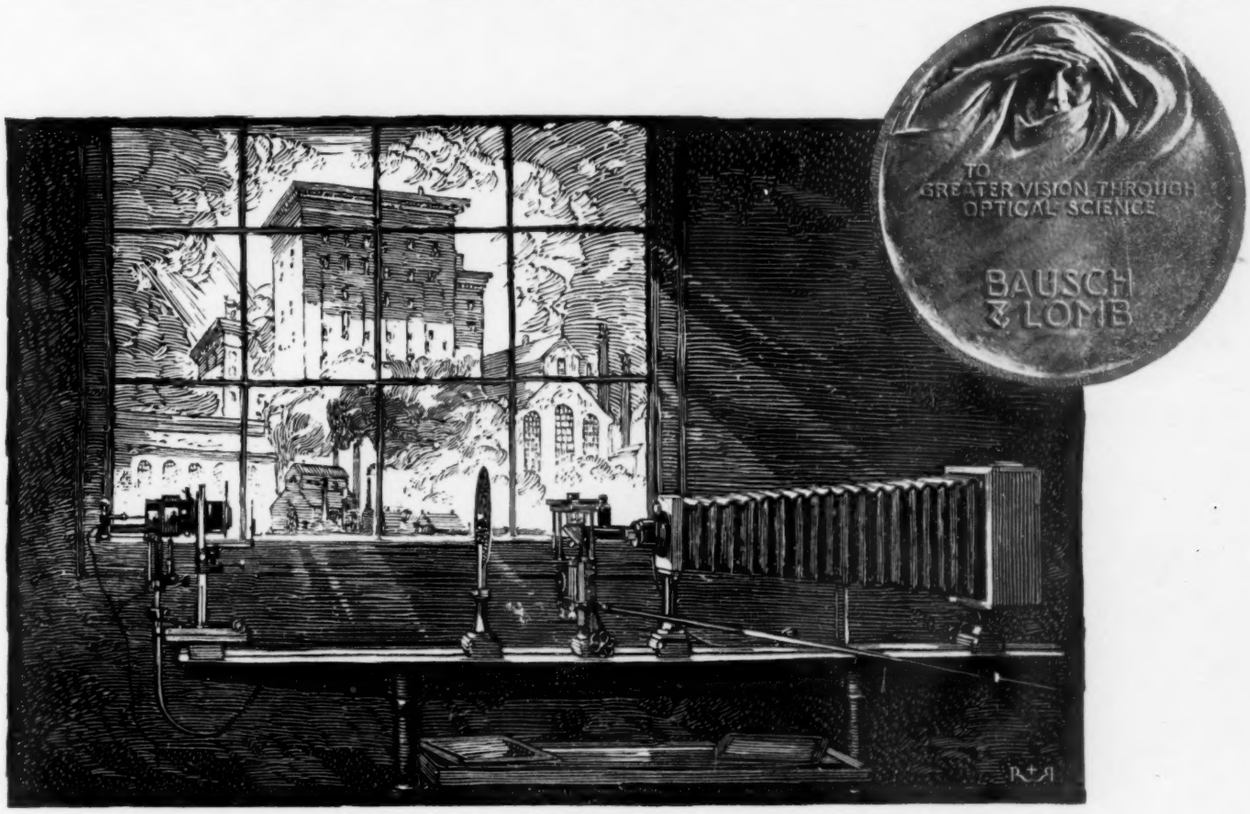
First published here in 1889, this standard work appears in a new dress, with an appendix that should make it doubly attractive to the school, the library and the home.

SYMBIOSIS. A Socio-Physiological Study of Evolution. By H. Reinheimer. London: Headley Brothers, 1920. 8vo.; 295 pp.

Evolution, like the god Siva, has two faces: Darwin painted the sterner one. Our present author limns the fairer countenance, calling it Symbiosis, but he rejects that definition of symbiosis which includes parasitism, its very antithesis. Some remarkable but strongly supported conclusions emerge; the vital rôle of cross-feeding in evolution; the dependency of food's effectiveness upon the measure of biological coöperation that went to its elaboration; the tendency of predaceous feeding toward monstrosity and the extinction of species; the conveyance by food of direct psychic influences. We may say of this author's work what he himself says of symbiosis—it has stimulative, integrative and directive force.

THE GREAT STEEL STRIKE. By William Z. Foster. New York: B. W. Huebsch, Inc., 1920. 12mo.; 265 pp.; illustrated.

The conscientious observer demands both sides of the question, and will welcome this inner history of a great strike from the viewpoint of a chief organizer. In conclusion, Mr. Foster frankly tells what is, in his opinion, the ultimate aim of trade unionism. In admitting that higher wages constitute but a temporary amelioration, he tacitly recognizes the chief weakness of the strike as the weapon of labor.



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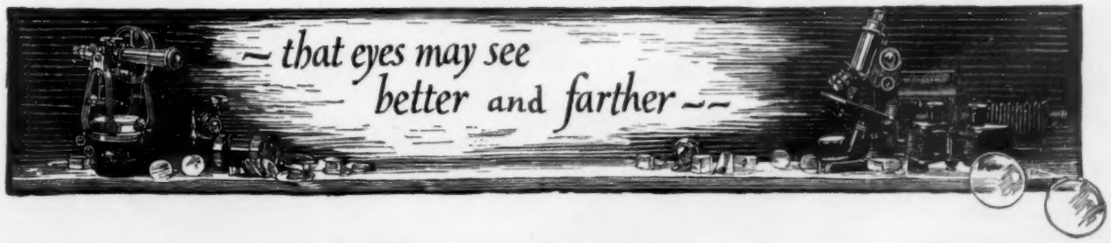

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